



TEXAS HIGHWAY DEPARTMENT

Construction & Maintenance

BULLETIN No. 10

1952



"GULF FREEWAY"

Foreword

This bulletin is published for the purpose of presenting practical information applicable to current highway problems. These conclusions and data are not necessarily endorsed by the Highway Department nor are they to be construed as instructions. Employees are invited and urged to submit suggestions and relate experiences which would benefit those engaged in the construction and maintenance of highways.

Photographic services are available and other assistance may be obtained if desired in preparing material for submission. All material and comments should be directed to the Chief Engineer, Construction & Maintenance, Austin, Texas.

Published Jointly by

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COMPILED AND EDITED
INFORMATION SECTION,
TRAFFIC SERVICES DIVISION
REPRODUCED
OPERATIONS DIVISION
TEXAS HIGHWAY DEPARTMENT
AUSTIN 14, TEXAS

Equipment & Procurement

Construction

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Maintenance

Traffic Services

As We See It . . .

Rarely have we heard so many and such conflicting reports and rumors about the present and future. With each passing day we hear about new "controls" — "cutbacks" — "allocations" or "substitutions" of various strategic materials. It's a welter of confusion and contradiction that makes it very hard to stick close to the fundamentals.

We will and must play our part in the nation-wide mobilization program designed to strengthen the national defense. It is a program the like of which has never been seen under normal conditions. Any program which seeks to control the national economy with all its complexities faces almost insurmountable obstacles. The agencies which administer the controls are generally seriously understaffed. They operate in an atmosphere of high tension, under heavy pressure, and under policies which by necessity have to be variable.

Tensions in the mobilization program can be expected to continue. We will face many uncertainties and serious problems in trying to carry out our operations in the months ahead.

Our hope lies in our ability to adjust our thinking and operations to meet these day-to-day changes . . . we must keep rollin'.

THAT'S OUR CHALLENGE!

THAT'S OUR JOB!



Curb Removal In Bridge Widening

J. A. SHELBY, SENIOR FIELD ENGINEER

Bridge Division

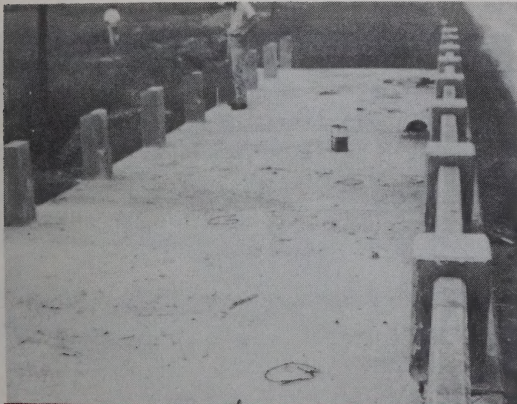
The field has recently developed a method of curb and rail removal in the widening of concrete bridges. This procedure is essentially a construction sequence in the removal of the existing bridge curb and railing in bridge widening work, as indicated by the sketch. The initial removal consists of breaking off the minimum section of the outside of the curb, as required to expose the transverse slab reinforcement for bonding to the new construction. The inside portion of the curb and the railing remains in place until after the bridge extension work is complete.

This procedure has the advantage of not interfering with the existing movement of highway traffic except for a short period while the inside section of the curb is being removed. Another advantage is the protection of workmen from highway traffic during the major part of the bridge widening work. Operations in the removal of the outside section of the curb can be

made from platforms which form a part of the falsework required for the superstructure extension. A rough surface may result along the slab beneath the curb section last removed; however, it is customary that the entire slab area of the existing structure and that of the widened section be covered with an asphaltic concrete to provide the proper roadway crown, which eliminates any objections from this standpoint.

To provide for this type of construction, appropriate provisions should be made on the structural details of the project plans.

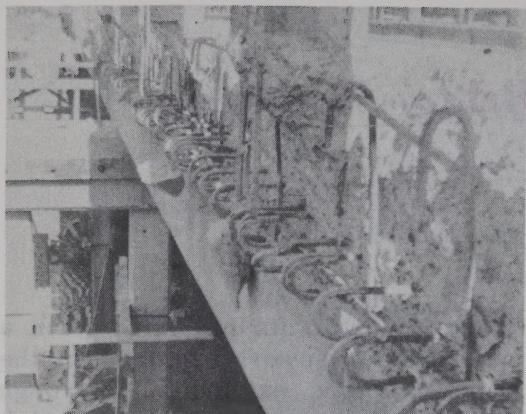
From the information we have, this method was first followed several years ago in the widening of bridges on U.S. 77 in Nueces County by Mr. T.O. Foster, then Senior Resident Engineer in District 16. Some other districts using this procedure are Districts 13, 15, and 21. The photographs were made of a bridge widening project in Jackson County, on U.S. 59.



Widening on south side, with old rail still in place.



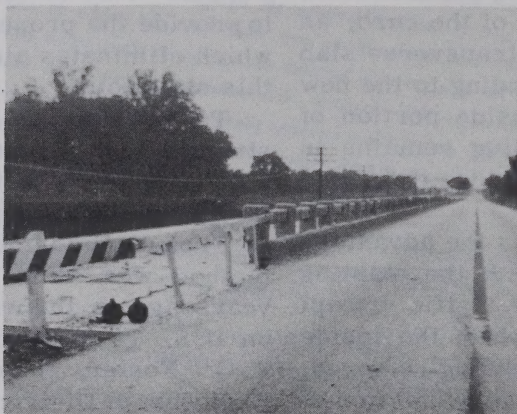
Five fourteen-foot CB7 slab span bridge widened from 24-foot roadway to 40-foot roadway.



Partial removal of existing curb in preparation for widening Garcitas Creek Bridge; U.S. 59 in Victoria County; Project F-543 (11) (12).



Method of removing existing curb after new widening slab had been placed. Project F-543 (11) (12) U.S. 59, Victoria and Jackson Counties.



There is no interference with normal traffic flow.



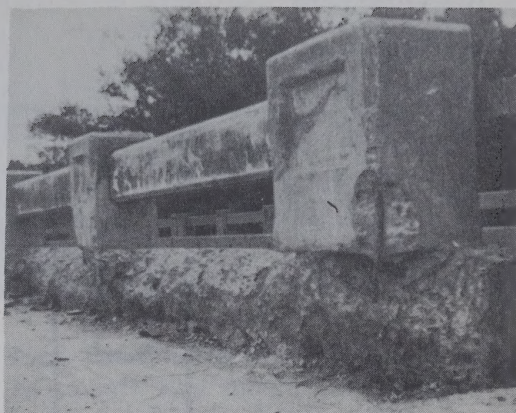
Widened slab section after portion of old curb has been removed.



Curb and railing intact during and after widening operation.



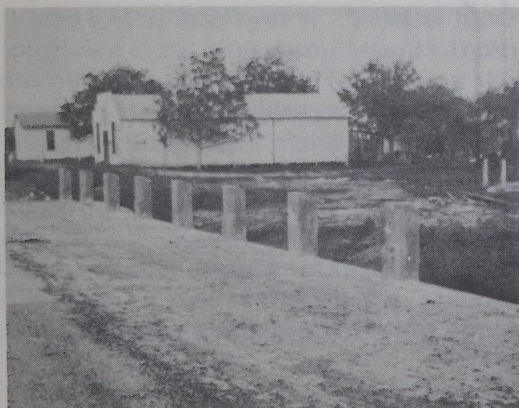
This structure is a ten-span, 33-foot, G-266 Mod. concrete girder bridge with concrete approach slabs.



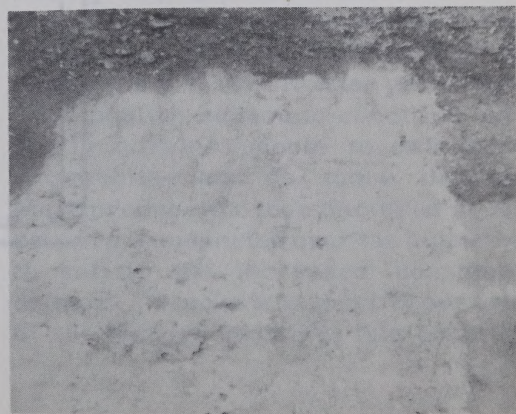
Old curb and rail still in place after new slab has been poured.



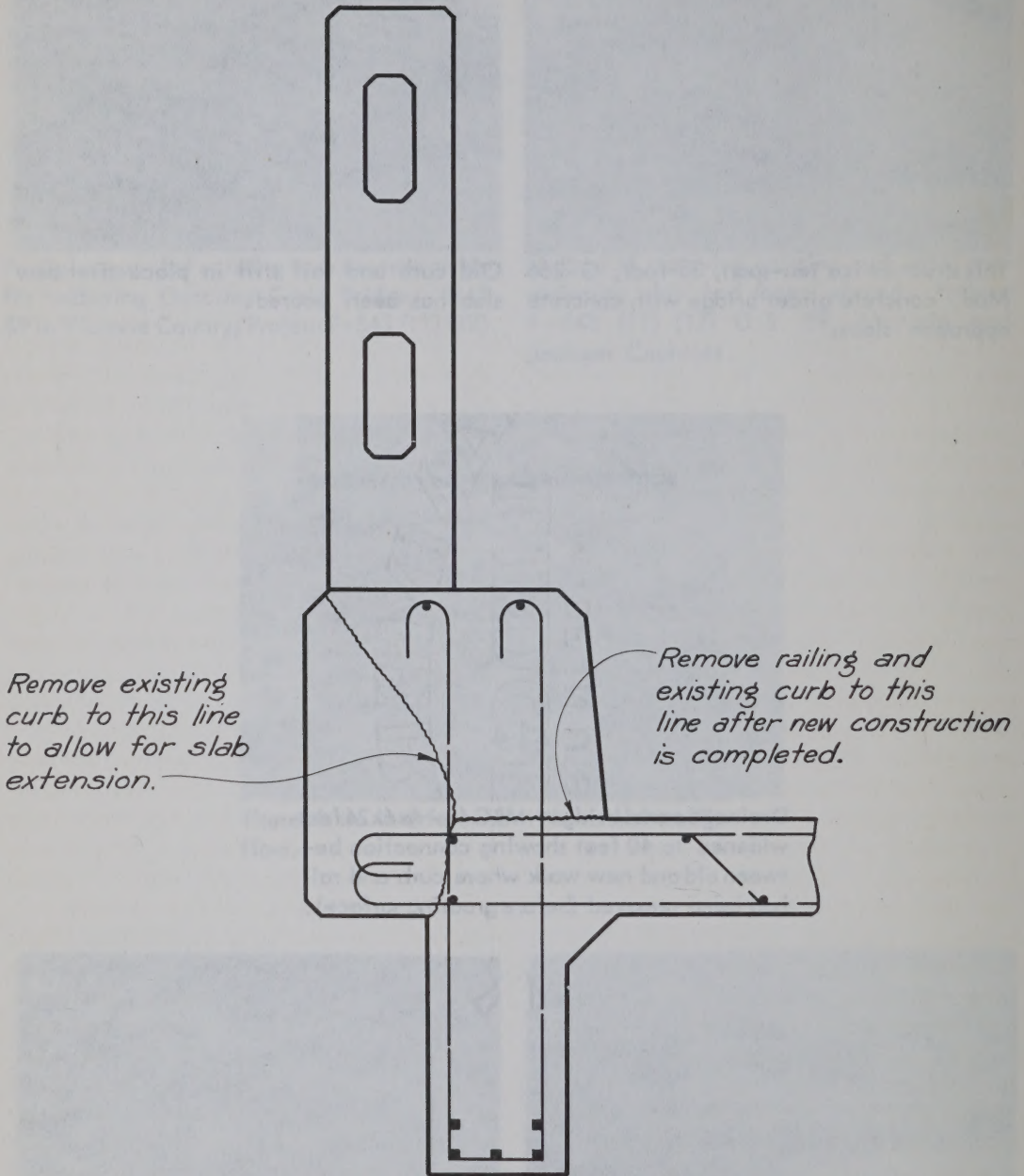
Drainage canal bridge - MBC 4 - 6x6x24 feet widened to 40 feet showing connection between old and new work where curb and rail had been removed (before grouting surface).



Shows widening of four CB7 slab spans from 24-foot roadway to 40-foot roadway. (Railing not yet in place).



Old and new connection where rail has been removed and surface grouted.



The Road Ahead



You have probably heard or read of the plea from our Highway Commission regarding future highway needs and the necessity for improving traffic safety in this state. Mr. D. C. Greer, State Highway Engineer, has long advocated that in order to provide good, safe highways, an organization must possess more foresight than hindsight. Thus the department feels that it should sound a note of warning to the public regarding the "road ahead." Today, our highway system encompasses over 40,000 miles of highways, many of which are now obsolete; many should be rebuilt, while the majority will require a tremendous amount of construction in order to eliminate the lurking danger of narrow bridges, blind curves, and other traffic hazards. We have, for too long, taken our good highways for granted as we do the trees seen along the roadway. The trees are provided and maintained by nature, but the highways must be provided and maintained by the taxpayers. Texans have long been accepting compliments from our out-of-state friends for having the finest system of highways in the nation. If something isn't done in the near future we will, in all humility, accept the compliment of having had the best system of highways in the country. Some people might classify a good highway as one which has a smooth surface and provides easy riding com-

fort, but actually this same road might be unsafe and dangerous because of narrow bridges, blind curves, steep grades, or lacking in some other type of good traffic safety. Of our 40,000 miles of highways in this state, some 16,000 miles are classified as "main highways," 2/3 of which, if rated by universal standards, are inadequate.

You may ask why we are suddenly faced with this dilemma. The answer is obvious. Most of our roads were constructed some 20 years ago for a life span of less than two decades. There are other reasons why our highway system is faced with this severe crisis:

1. INCREASED TRAFFIC...

We still use the expression "hit the open road," but did you ever stop to think that the open road disappeared with the horse and buggy? There are 3 1/3 million vehicles registered in Texas today as compared to approximately one-half this number in 1940. Today we have a payroll of 204 billion dollars annually in this country as compared to 75.4 billion ten years ago. This healthy economic condition naturally enables people to own more automobiles and do more driving. More produce and manufactured products are transported over the highways to satisfy the increased consumer demand. Trucks transport 75 per cent of the tonnage hauled in this country.

Text of speech given by Tom H. Taylor, Information Section, Traffic Services Division, at the Texas Motor Court Annual Meeting in Dallas on December 4, 1951.

Consequently, these and other relative factors place a greater demand and strain on the highway system.

2. WARTIME NEGLECT...

During World War II, the severe shortage of manpower and material, plus the excessive use of our roads, prevented proper maintenance and upkeep necessary for their preservation.

3. OUR HIGHWAYS ARE DYING...

They were constructed in that great highway era of the 20's for a life expectancy of less than two decades.

4. DIVERSIONARY SPENDING...

Only 10 cents out of every \$1 spent on automobile transportation flows into the state highway fund. For every \$3 paid by automobile users in taxes to the Federal Government, only \$1 is returned to the state for spending on your roads. Many of you attending this convention probably drove a distance of some 200 miles. The segment of highway you used represents a state asset or investment of about 20 million dollars, but do you know that you only contributed approximately 25 cents in gasoline taxes to the building and maintenance of this 200 miles of road. You paid a similar amount in gasoline taxes to the Federal Government, of which approximately 1/3 or 8 cents will be returned to your road fund, and this can be spent only for the construction of new highways. Texas today has one of the lowest gasoline taxes in the country. We pay a total of 6 cents on each gallon of gasoline, of which 2 cents goes to Uncle Sam, 1 cent to the public school fund, 1 cent to the retirement of county road bonds, and only 2 cents finds its way into the highway fund. After your gasoline tax has been divided, only 1/3 goes to the purchase and for the upkeep of the actual product you are paying taxes to use.

5. INFLATION...

Today \$2 will build and maintain

about what \$1 did in 1941. You folks well know how much labor and material a dollar will buy today as compared to ten or twenty years ago.

6. CITY BOTTLENECKS...

The main streets of our communities were not built to accommodate today's tremendous increase in traffic demands. Inadequate parking facilities, narrow streets, and other city traffic problems tend to congest through traffic. With limited funds, we have begun to construct expressways through some of the larger cities, and in many instances the astronomical cost on some of these expressways has amounted to something like a million dollars a mile. Consider for a moment that the entire highway system is operated on a budget of something like 110 million dollars annually. This won't build many miles of expressways.

Last year there were 2,410 persons killed on Texas highways. There were 68,801 personal injuries and a total of 202,041 accidents of all kinds which cost the public over 96 million dollars. This loss of life and personal property was indeed tragic -- in many cases it was due to human or mechanical failure, but in too many instances it was caused as a direct result of obsolete highways.

Our nation is literally a "nation on wheels." We have more cars and trucks than the rest of the world combined. We have 3 1/3 million miles of highways, of which 300 thousand miles are within city limits, constituting streets and thoroughfares. There were 3 1/3 million vehicles registered in Texas this year, which means that we have something like one vehicle for every 2 1/3 persons in this state. There is no need for me or anyone else to try and convince you of the value of our highways or what they mean to us socially and economically. But, we of your Highway Department, feel that it is our duty to explain to the citizens of Texas the

condition of our existing highways and the approaching crisis which awaits us on the "road ahead." A way must be found and a program adopted by the citizens of this state which will provide an adequate construction and maintenance fund if we are to continue to enjoy the best roads in the Nation and prosper from recreational and commercial travel.

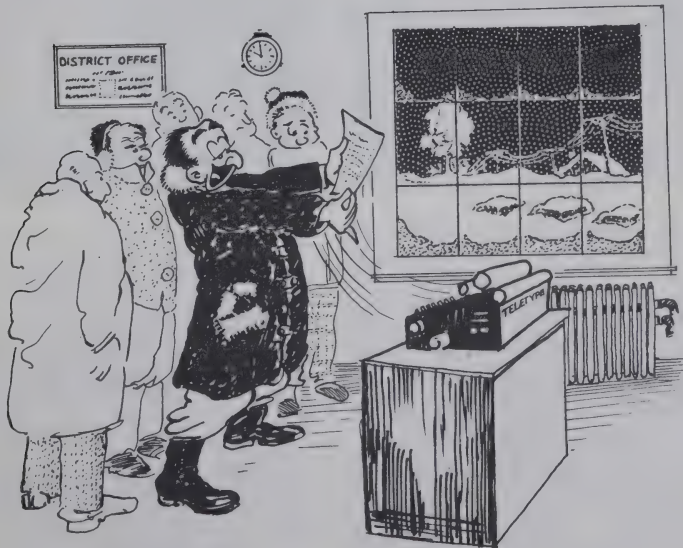
It has not been my intention to lead you to believe that our roads will disintegrate and disappear overnight, but merely to outline existing conditions and present a comprehensive picture of the possible road ahead. Your State Highway Engineer, Mr. D. C. Greer, has developed a program that will overcome these highway deficiencies within five years. This program will cost 219 million dollars per year, which includes the annual cost of overhauling and operating the entire highway system.

It is not the duty or responsibility of the Highway Department to say "how" the funds necessary for an

adequate highway improvement program should be financed. This is a legislative function and responsibility. It is for you and the citizens of this state to decide and then dictate your opinions to your elected legislature and they, in all their wisdom, seeing the problem from all angles, will offer an equitable solution.

Such a program will need your individual and collective support. You have a dual responsibility in highway improvement, first as citizens interested in good government, and second as motor court businessmen and women. Economic studies indicate that the market for the sale of lodging accommodations for motorists is far from saturated, but poor highways could easily become a serious sale obstacle. We of the Highway Department are sounding the alarm for financial help and if financial help isn't forthcoming in the near future, our tourists will probably begin to comment that Texas had the best system of highways in the Nation.

— — —



"Hmmm heres D-16's road condition report for today, 'all highways reported free of ice and snow throughout the state. Traffic normal. Clear skies and tropical temperatures prevailing."



Hats Off ...

The above picture is of Louie Riehs, La Grange, Texas, and his six-year old mowing machine which has never been in the shop for repairs. Records show that this machine has worked 3,463 hours with a total expense for repairs of tractor and mower, including all blades and guards, of \$434.13, or less than 13 cents per hour. The tractor has had only minor repairs. This machine was purchased June 30, 1945, at a cost of \$949.41. The machine now shows a six year profit of \$1,771.39.

Mr. Riehs recently received his 25-year Service Award, and was commended for his splendid record on this machine.

Pavement Widening

Submitted by

M. G. CORNELIUS, District Engineer

The four pictures below show some conditions in connection with the pavement widening on U.S. 59 between Edna and Foster Field. These pictures were supplied by Mr. W. A. King, Senior Resident Engineer.

The eighteen-foot concrete pavement is being widened to twenty-four feet by the addition of six feet of hot-mix asphaltic concrete pavement, after which a level-up and surface course will be placed.

During the base widening, which consisted of placing three layers of black base, it was noted that it was difficult to judge the amount of drop-off from the old pavement to the first and second layers of the black base. To remedy this, the triangular barricade was devised, and the contractor offered his full cooperation in furnishing and placing these at suitable intervals as a warning to the motorists. It proved to be a relatively inexpensive and effective device. Flares and reflectorized strips were also used to supplement these triangular barricades for night drivers.



INTEROFFICE MEMORANDUM

TO: Mr. B.B. Freeborough Date November 21, 1951
FROM: Orville G. Miller Responsible
SUBJECT: Two Week Stay at Materials and Tests Laboratory Desk D-14

The first part of my stay at the laboratory was spent in the soils section. This section tests subgrade and base samples for the soil constants and makes screen and hydrometer analysis of the material. I made several tests for the soil constants and observed the hydrometer and screen analysis procedures. The necessary calculations to evaluate the test results were explained to me.

We ran tests to find the density of in-place material using both the Sand-Funnel and the Rubber Balloon methods.

Although there were no samples being tested at the time, we did run a modified bearing value test on a soil asphalt sample. We also ran a punching-shear test on a soil cement sample. Due to the long curing time needed, the tests were made on freshly mixed materials.

Some of this time was spent in the asphalt section. The various tests to determine viscosity, ductility, flash point, etc. were observed on samples they were testing. I had a very enlightening discussion with Mr. Chaffin about the various types of asphalts, emulsions, etc. It was interesting to note how much materials differ between the various producers, and yet they all meet the specifications.

A great deal of my time at the laboratory was spent dealing with the triaxial method of testing subgrade and flexible base materials. Mr. McDowell explained the reasons for using this method, the necessary calculations, and the interpretation of the data received from these tests.

The personnel at the laboratory willingly explained the various procedures and calculations, as well as ably answering my questions. In conclusion I want to say that these two weeks were well spent in that it will enable me to see more clearly the meaning of test reports and also for the general knowledge gained about testing procedures.

OGM:pr

OGM.



CENTER STRIPING

*Striping Land Service Roads That Do Not Fall
Under Our Regular Striping Policy*

Traffic Services Division

District 22 has been experimenting with a four-inch asphalt center line and barrier stripe at restricted sight distances on their land service roads which do not fall under our striping policy. Attention is called to the fact that this center and barrier stripe is placed only for the length of the restricted zone and on no other sections of the road. The picture above shows the results of such a stripe. We believe that this is a worthwhile safety measure, and probably should be followed in other districts.

We do not intend to establish a policy on this procedure, but no objection will be offered to those who wish to place such a stripe.



Spring Tonic

Peps Up Equipment Performance

EQUIPMENT AND PROCUREMENT DIVISION

The best tonic for equipment is a little preventive maintenance to insure high output during the torrid summer months ahead. A "spring tonic treatment" for equipment, like money in the bank, pays off with interest. It keeps your equipment producing longer with fewer delays for repairs. A few steps, which if undertaken now will save repair dollars and down-time later, are listed here. These preventive maintenance measures, not expensive nor time-consuming, can be performed in the field. If they are postponed or overlooked real trouble may develop.

Engine lubrication is the logical place to start a spring equipment checkup program. Old oil, which is dirty and diluted by cold weather starting, should be changed to recommended summer grade. It is important to drain old oil from a hot engine. Another major step that should be taken without fail early in the program is that of draining and flushing the cooling system. After draining the antifreeze, fill the system with a solution of from five to ten pounds of ordinary washing soda and water, depending on the size of the engine. Leave the radiator cap off and operate the engine until the water is hot, then drain and flush with clean water. Refill with soft water, and add the recommended amount of rust inhibitor.

Next, check the water hose clamps for leakage and tighten where necessary. An excellent check for leakage is to remove the fan belt so that the water pump will be inoperative. Fill the radiator to the top, leave the radiator cap off, and while the engine is running, hit the throttle hard and watch for air bubbles. They are a good indication of leakage around the cylinder head gaskets.

While conditioning the cooling system, check and adjust fan belt tension. Inspect the fan for bent and loose blades, and check the fan hub mounting cap screws for tightness. Clean the spaces between the radiator fins by blowing them out with an air hose or flushing them with a water hose.

Clean the air cleaner tray and refill with oil and kerosene, half and half, to allow easy flow of air to the manifold without reducing the cleaning efficiency of the unit. Tighten air cleaner connections and examine the pipe from cleaner to manifold for holes or cracks. Abrasives entering the engine from improperly filtered air can cause serious damage to rings and sleeves.

On equipment with gasoline starting systems, it is good procedure to check the gasoline strainer, then clean and wash the bowl at the same time. Check distributor and magneto points for wear and correct gap setting. Another good tip for spring and the year around is to ser-



SPRING CHECK-UP
improves performance,
cuts repair costs, and
averts work stoppages.

vice your battery. Also, to insure fast starting, lubricate the magneto impulse coupling with kerosene or light machine oil.

Look at the diesel fuel water trap, too. It may be time to take it apart and clean it. Replace oil filter elements. In most units, these elements should be replaced with each oil change.

If transmission and final drive lubricants have not been changed for a season, now is the time to do it. Oil in the transmission and final drive, thinned during the winter for easier operation, should be changed to a heavier grade before hot weather. Work the equipment until the lubricant is warm, then drain. Refill with the grade of oil recommended by the manufacturer.

Greases of certain kinds and consistencies are recommended for

different locations on a machine as a result of years of test and experience. The manufacturer has recommended a definite grease for a compartment or bearing after having received the benefit of this experience.

Obtain good grease of the grades needed. Keep containers covered.

Keep greasing equipment clean. Remove all dirt from openings and fittings when using greasing equipment.

Extreme cleanliness is essential when performing a lubricating job. A few grains of sand entering during lubrication period will soon amount to enough to wear the part out.

The spring working season is here. Take advantage of every opportunity, when not working, to check your equipment. Make sure that it is in good shape now and you can expect trouble-free operation this summer.

— — —

MAKE THIS YOUR JACK INSPECTION MONTH

More and more Districts are adopting the standard practice of periodically inspecting all their jacking equipment. And why not! A faulty or missing jack can mean an expensive, embarrassing road delay. Jacks sometimes disappear from tool boxes — they occasionally need oil — and sometimes the wrong-size jack is accidentally shifted from one truck to another. It pays to check!

SAVING CRITICAL MATERIALS

HARRY L. GRAY, *Associate Designing Engineer*

Land Service Roads Division

District 22, as many other districts in the state, is frequently compelled to build structures of bridge classification on low traffic count F. M. Highways. This often creates the problems of justifying overruns in funds allocated for construction and of supplying critical war materials. This situation was recently handled with a commendable display of ingenuity in Maverick County by Resident Engineer G. P. Brown and staff.

In the subject case two adjoining county roads, now designated as F. M. 1590 and F. M. 1591, serving as rural loops enclosing the communities of Normandy and Quemado respectively with U.S. 277, the construction of three small bridges of 125 feet total length in a thinly populated area was

comparative breakdown for the bridges (found in the table on this page).

Further investigation within the district led to an entirely new angle of design than those indicated above. A bridge on S.H. 55 in Real County, constructed 22 years ago of a lightly reinforced concrete deck on treated timber stringers and bents, has been more than serviceable over the period of years, with a minimum of maintenance. Completing the picture, treated timber stringers matching in depth those in the subject bridges were being salvaged from the Nueces Bay Causeway. Summation of the two thoughts produced the idea for a design giving maximum utility to the materials on hand. Figure 1 shows a general section of the final design.

<u>Design</u>	<u>Load Rating</u>	<u>Roadway</u>	<u>Estimated Cost</u>
Repair with treated timber	H-6.0	17' to 18'	\$ 7,500
Repair with treated timber	H-10	17' to 18'	11,300
Repair with treated timber	H-10	20'	12,800
Multiple Box Culverts and Riprap	H-20	-	9,700
New Slab Spans	H-10	20'	15,400

proposed. The existing 17-foot roadway bridges rated at H-4 loading consisted of treated timber--four pile bents, eight inch by ten inch caps, three inch by twelve inch stringers flooring and railing. Field investigations indicated that the piling, caps, and stringers contained many years of serviceability with no salvage value remaining in the floor and railing. Estimated costs analysis revealed a

The field engineers found a sufficient number of four inch by twelve inch stringers from the Causeway to rehabilitate the three bridges to an eighteen foot clear roadway. The four inch by twelve inch timbers were doubled, as were the three inch by twelve inch size with a rearranged spacing to provide the desired strength to meet with A.A.S.H.O. specifications for an H-10 loading. A lap arrange-

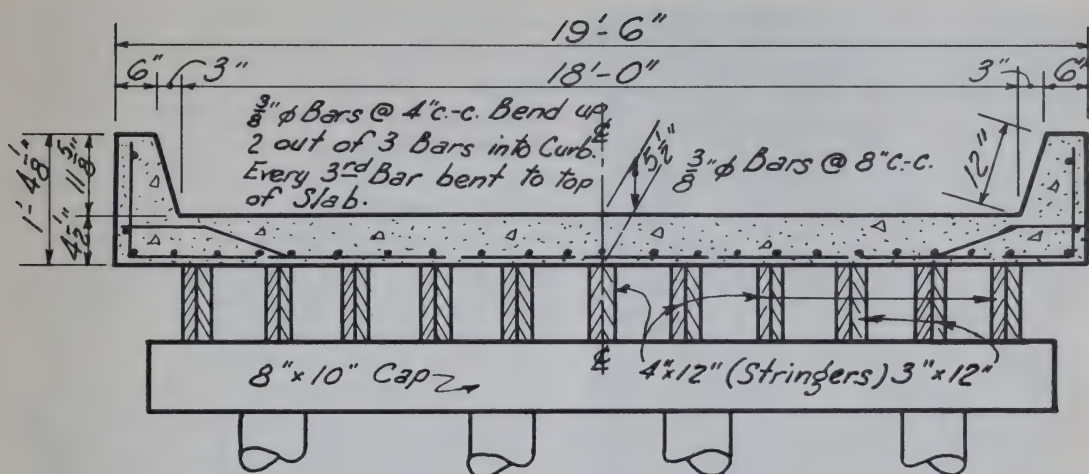


FIG. 1.

ment of the stringers at interior caps, as shown in Figure 2, was devised to provide adequate bearing over the eight inch caps and to minimize the spacing for the stringers. The doubled timbers of five inch and seven inch total widths, when lapped side by side over interior bents, would create a stringer spacing too great to be spanned by a lightly reinforced con-

crete deck. It is noted from Picture 1 that the inside members of stringers from opposing spans were butted together at the center of caps while the outside lines of members were extended beyond the cap. When nailed together the stringers provided some continuity between adjacent spans.

The concrete slab design, reinforced with three-eighths inch transverse and

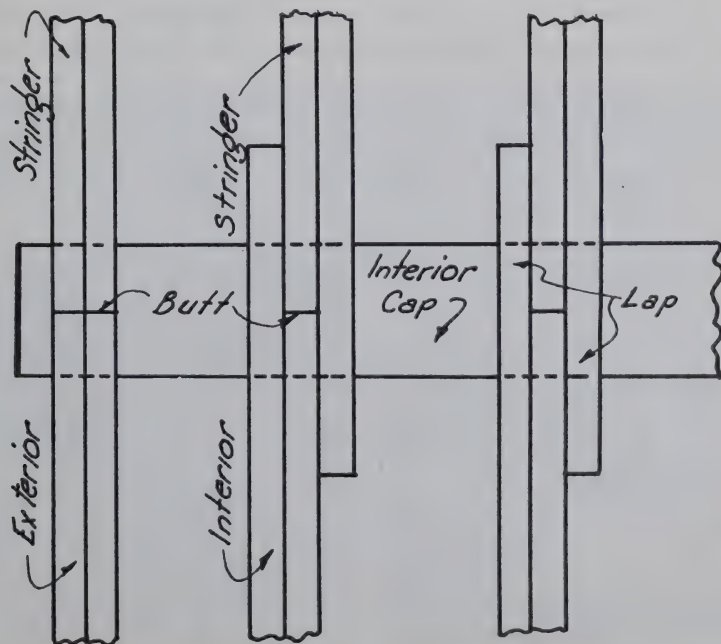


FIG. 2.

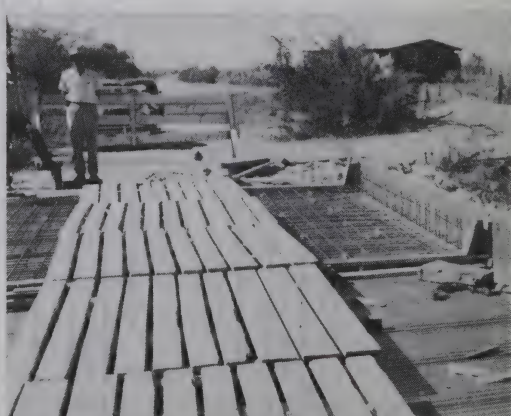
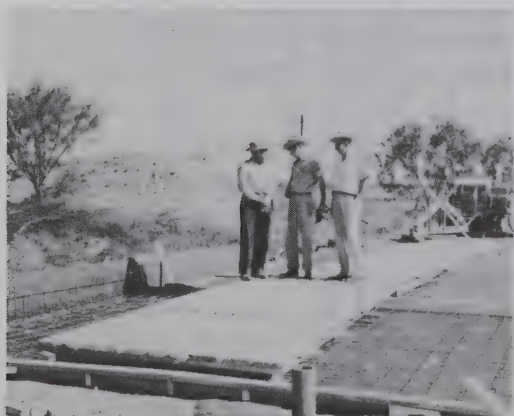


Picture 1 - Looking west under the bridge at Sta. 63+88.5 on F.M. 1590. The double stringers and timber bearing blocks over interior bents are indicated. Resident Engineer G.P. Brown said construction was simplified by utilizing the stringer arrangement above.

longitudinal bars spaced at four inches and eight inches center to center, respectively, consisted of a minimum depth of four and one-half inches at the gutter line increasing uniformly to five and one-half inches at the center line. With minor variations at the curb, all steel was placed one and one-

half inches from the bottom of the slab with no temperature steel provided in the top. The twelve inch by six inch curbs were cantilevered beyond the outside stringers and reinforced by bending every other transverse bar up into the curb with the remaining transverse bars bent from the bottom to near the top face of the slab at the curb line to resist negative movement. The slabs are separated by one-half inch open joints at the caps to avoid the need for additional reinforcing steel to offset negative live load moments. Pictures 2 and 3 indicate the steel placement within the forms. The above design for the three bridges requires a total of 4,400 pounds of reinforcing steel as to 22,100 pounds required for new structures, giving a total saving of 17,700 pounds of steel.

The proposed design permitted the use of a light weight decking material in forming the slab. Plans specified Steeltex Floor Lath or its equivalent, but the contractor preferred Corruform, a light gauge corrugated metal as indicated in Pictures 4 and 5. Corruform was more expensive, but stronger than Steeltex. The contractor's preference was based upon the possibility of tearing or ripping Steeltex while vibrating the concrete. To obtain maximum strength during construction, the corrugations were placed normal to the stringers or



Pictures 2 and 3 - showing slab forming and reinforcement in place prior to pouring concrete. Note form for one-half inch open joint between spans.

supports. The slab and steel dimensions were measured from the top corrugations rather than the troughs to provide the maximum actual dimensions equal to or greater than the design dimensions.

The contractor's bid plus the usual 10 per cent for engineering and contingencies indicated a cost of some \$3,800 to rehabilitate the three subject bridges. By using the same low

bid unit prices, it would have cost the state \$10,800 to construct new structures to replace the old, indicating a saving of \$7,000 or \$56 per foot of bridge. The Land Service Roads Division congratulates the field engineers for their original thinking along this line of Farm to Market Bridge Design and is proud to have participated in a job "well done."

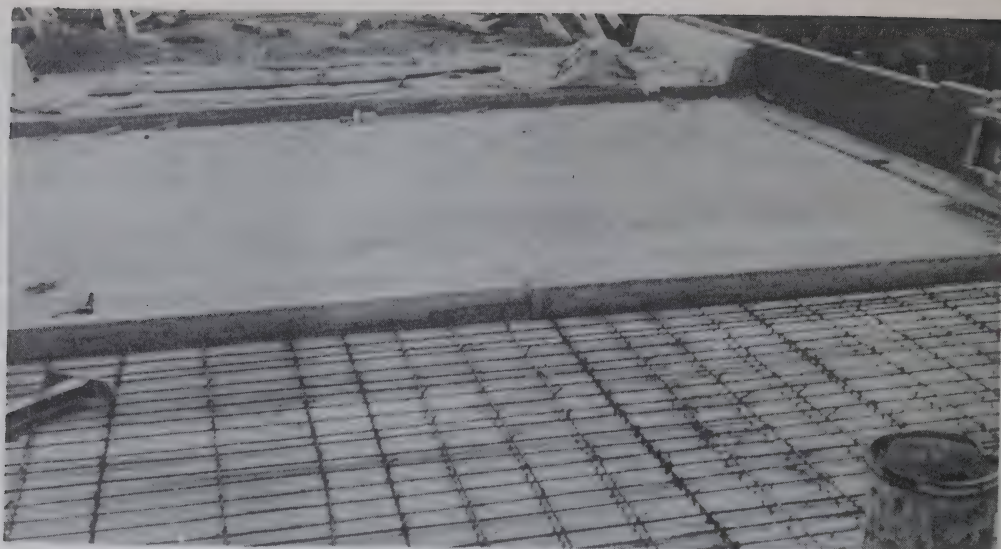


Pictures 4 and 5 - showing Corruform placed as deck forming for light reinforced concrete slab. With the corrugations running normal to the stringers, Corruform is sufficiently strong to support the weight of a man standing between stringers.

The following four pictures courtesy G. P. Brown, Senior Resident Engineer



Close-up of slab and Corruform.



One slab complete, and steel in another.



Typical structure before rehabilitation.



Completed structure.

BUNKHOUSES ... 1952 MODEL

EQUIPMENT AND PROCUREMENT DIVISION

District 13, Yoakum, has several floating crews that are finding it more and more difficult to find lodging in the small towns in which they are required to stay in order to be near the work they are to perform.

In most cases they are required to spend from four to six hours seeking places to stay in such towns as Victoria, Hallettsville, La Grange, and others. The lodging facilities in these towns have never been too plentiful and just recently several large manufacturing plants have moved in, making housing almost impossible to find.

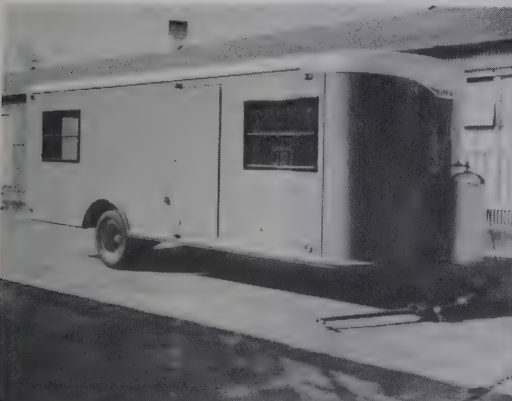
It was decided in order to carry on the work it would be necessary that the District provide some place for these men to lodge. They requested Camp Hubbard to construct two highly mobile bunkhouses which could be trailed behind a dump truck. These

bunkhouses are to be stationed at or near our section warehouses where sanitary facilities are available.

The problem was to construct sturdy, highly portable bunkhouses that could be easily kept clean, provide the necessary facilities for overnight lodging, and at the same time be low in original cost and upkeep.

In the pictures appearing on these pages you will find Camp Hubbard's answer to this problem.

The bunkhouses provide space for four bunks, and if necessary, these bunks could be double-decked and provide sleeping space for eight men. They are of permanent construction and while not pretentious in appearance, these do present a modern vehicle, and last but not least, the total cost will not exceed \$2,500 on each unit.



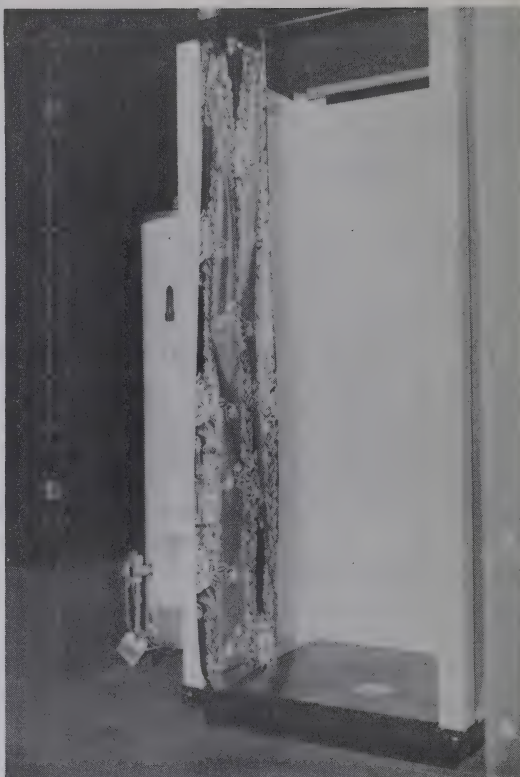
External view showing mounting of Butane gas tank and door arrangement.



View of trailer hitched to truck ready for moving.



Internal view showing lavatory and storage closet arrangement.



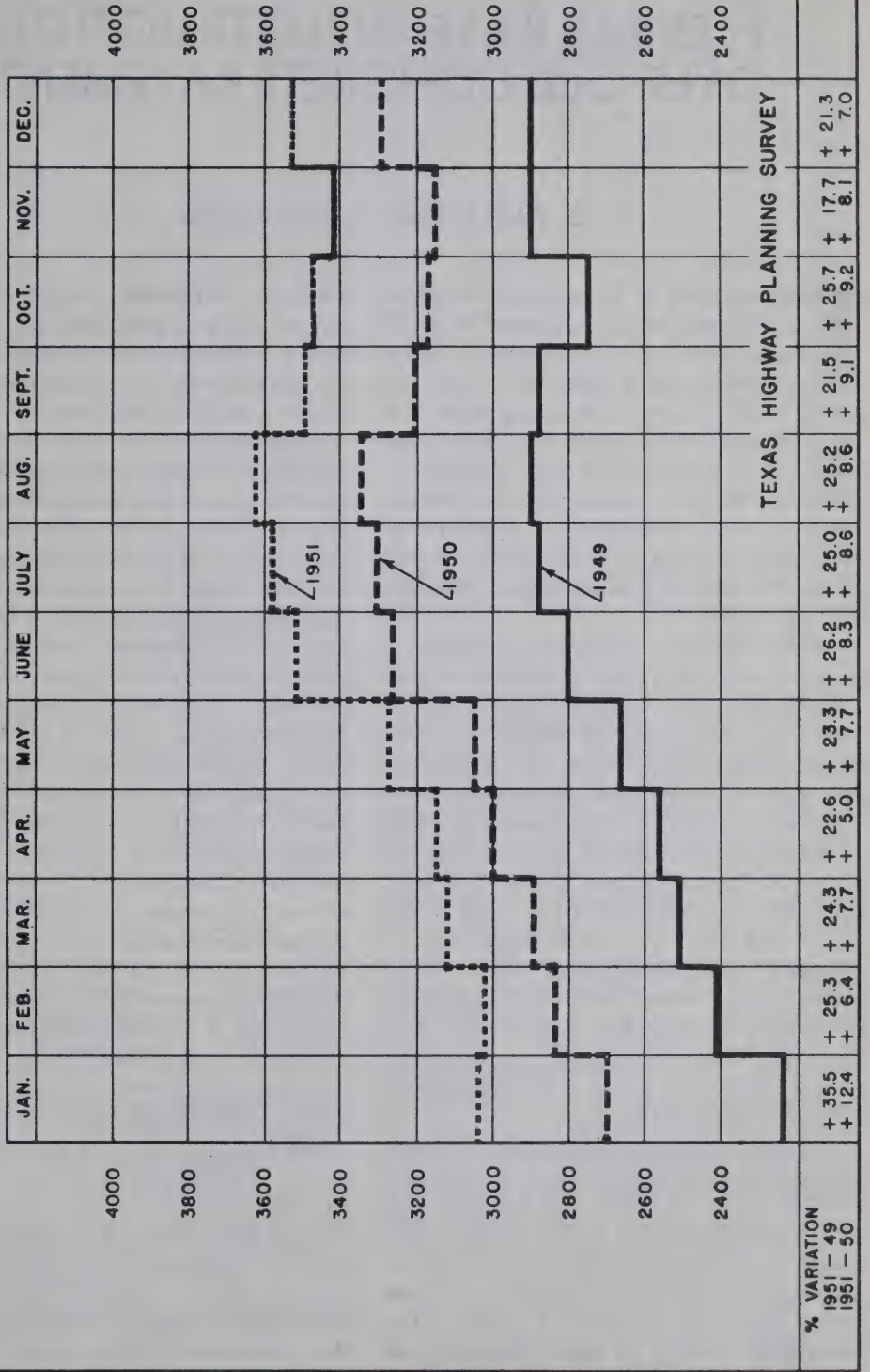
Internal view showing shower and hot water heater arrangement.



Rear view

STATE OF TEXAS VARIATIONS IN TRAFFIC VOLUMES

AT
73 REPRESENTATIVE STATIONS ON THE STATE HIGHWAY SYSTEM
GRAPH SHOWS AVERAGE DAILY VOLUMES BY MONTHS
(All data from Automatic Recorders)



FLEXIBLE BASE CONSTRUCTION OVER OLD CONCRETE PAVEMENT

C. C. CAGLE, *Senior Resident Engineer*

This report is concerned with the design and construction of flexible base and hot-mix asphaltic concrete pavement on a section of U. S. 75 in Grayson County, extending from the Collin County line north toward Sherman for a distance of nine miles. A contract for the construction of this project was awarded to City Construction Company at a bid price of \$454, 476. 80, and work began December 23, 1950.

This section of road carries a traffic load of from 3, 500 to 4, 000 vehicles per day, about 25 per cent of which are commercial vehicles. The existing concrete pavement, an eighteen-foot slab of nine inch by six inch by nine inch Bates Type section, was constructed in 1930 on subgrade composed of plastic soils of the A-7 group. In 1943, portions of this road were improved by the construction of sledged stone shoulders, which were eleven feet wide with a compacted thickness of twelve inches adjacent to the slab, and which were constructed of a soft, white limestone, generally called "white rock."

The pavement remained in excellent condition until about 1942; then wartime traffic took its toll, and by 1946 the slab showed definite signs of distress. Many cracks had developed, and the pavement was pumping at almost every joint. In an effort to retard the complete failure of the pavement, an asphalt underseal was introduced during 1946, but nothing was done to prevent the infiltration of surface

waters, and within a few months the pavement was pumping again. Fractures continued to develop at an ever-increasing rate and maintenance became a major problem.

DESIGN: In 1950, funds became available for the improvement of this section of road and design studies were begun. While reconstruction might be effected in a number of ways, it was evident that any acceptable design must include utilization of the existing concrete pavement; both as a subbase and as a detour during the construction period. The earth subgrade was of doubtful value, and its bearing power could not be increased as long as the old concrete pavement remained in place. However, the unit load on the subgrade could be reduced by increasing the thickness of the foundation structure above the subgrade level. It appeared that this desired increase in base thickness could be secured in the most economical manner by constructing a flexible base over the old concrete pavement, and it seemed probable that such design might also assist in preventing the transfer of cracks from the old pavement to the new. Therefore, decision was made to place flexible base material over the old concrete to a compacted thickness of approximately eight inches, and to cover this with a three inch thickness of type "C" hot-mix asphaltic concrete. The base thickness determination was empirical.

Certain qualities seemed essential in the flexible base material if satis-

factory results were to be secured. The stone should be sound and well graded, and the aggregate particles should be angular. It was desired that the stone fragments be fully interlocked, which indicated that there should not be an excess of binder material. Therefore, flexible base material was specified as follows:

"The material shall be obtained from approved sources; shall consist of durable particles of well-graded crushed stone mixed with approved binder material; and shall be free from thin or elongated pieces, lumps of clay, soil, or vegetable matter. The material may be crusher-run or materials may be mixed from two or more sources in such proportions as to produce the gradation herein specified. The material shall be so graded, within the limits shown, as to insure the construction of a dense base, free from excessive voids. That portion of the material retained on the one-quarter (1/4) inch screen shall have a per cent of wear of not more than 45 when subjected to the Los Angeles Abrasion Test (AASHTO T-96). Samples of flexible base material, taken from the completed base course after all rolling has been completed, when properly slaked and tested by standard laboratory methods, shall meet the following requirements:

Retained on 2" screen	0%
Retained on 1/2" screen	20-60%
Retained on 1/4" screen	40-75%
Retained on 40-mesh sieve	65-80%

The material passing the 40-mesh sieve shall be known as "Soil Binder" and shall meet the following requirements:

- The liquid limit shall not exceed . . . 35
- The plasticity index shall not be less than 4 nor more than 12.
- The linear shrinkage shall not exceed 7%

The completed design provided for 24-foot pavement with 10-foot surfaced shoulders, and included the completion

of white rock shoulders, construction of flexible base over the entire road-bed, and construction of hot-mix asphaltic concrete pavement. As shown on the typical sections, the hot-mix was laid in a trench which was formed in the flexible base material.

CONSTRUCTION: Since no detour was available, it was necessary for the base construction to be carried out on one-half of the road at a time. The existing white rock shoulders were widened, and additional crushed white rock shoulders were constructed where required. The west shoulder was then plated with a two-inch compacted thickness of flexible base material, and traffic was directed on to the west half of the concrete pavement and the west shoulder, while flexible base, prime, and one-course surface treatment were completed on the east half of the road. Traffic was then diverted to the east half of the road and the west half was completed in a similar manner. The construction of hot-mix asphaltic concrete pavement completed the work.

The crushed white rock material, used as subbase on the shoulder areas, was quarried from a designated local source. All of the crushed material passed the five-inch screen, and less than 25 per cent of the material passed the one-fourth inch screen. The flexible base material consisted of shipped-in crushed stone mixed with a local sand admix. When subjected to the Los Angeles Abrasion Test, the stone was found to have a per cent of wear of about 25. The native sand had a plasticity index of 6, and all of the sand passed the 40-mesh sieve. The materials were mixed on the road with a ratio of 25 per cent sand to 75 per cent stone, and after all rolling had been completed the mixture was found to have the following characteristics:

Retained on 2" screen	0%
Retained on 1/2" screen	45%
Retained on 1/4" screen	58%
Retained on 40-mesh sieve	69%
<u>Plasticity index</u>	<u>6</u>

The flexible base material was compacted by rolling with pneumatic tire and flat-wheel rollers, each lift having a loose thickness of three inches.

Type "C" hot-mix asphaltic concrete was composed of OA-135 oil asphalt, crushed stone, crushed stone screenings, and native sand. The usual asphalt content was 4.7 per cent, and the resultant mix produced densities of about 97 and stabilities of from 50 to 60. The 150 pounds per square yard leveling course was spread by motor grader, while the 150 pounds per square yard surface course was machine-laid.

OBSERVATIONS: This project has not been under traffic for a sufficient length of time to warrant definite conclusions, but the following observations are offered:

1. Since this design makes no provision for patching the old concrete pavement, there is the possibility that continued movement of floating or tilting sections of the slab may result in failure of the superimposed flexible base. Fortunately, the probability of such failure is not as great as might appear, since the unit stress on the surface of the concrete pavement is considerably less than it was before the flexible base was added. Some few such failures are to be expected, but they can be corrected at a fraction of the cost which would be incurred in patching all failed sections of the old pavement. Failures of this type which

developed during construction were small and few in number, and were easily repaired by removing the failed material and filling the cavity with hot-mix.

2. Some difficulty was anticipated in constructing the trench section for the hot-mix asphaltic concrete pavement. However, it was found that an experienced motor grader operator can secure the desired results at minimum cost - any other kind of operator has no place on flexible base construction. Incidentally, the use of this trench permits the use of one surface treatment on shoulder areas instead of two, and obviates the necessity of building a thin layer of flexible base adjacent to the hot-mix.

3. As previously stated, traffic was first directed on to the temporary shoulder construction, consisting of white rock with a thin covering of flexible base material. It was thought that this surface could be maintained under traffic in a satisfactory manner, but maintenance was difficult and there was an undue hazard from flying stones. In the future a seal coat or single surface treatment will be specified for the surface of such temporary shoulders.

4. This project was constructed at a cost of about \$64,000 per mile (including engineering). However, more than half of the section was already provided with white rock shoulders, and the cost will be somewhat greater for roads which have no existing shoulder construction.



Typical view of old concrete pavement.



Excavation for subbase on shoulder. Note patch material placed in maintenance of slab.



The old concrete had settled in some places.



Typical pumping of old pavement.



Construction of crushed white rock subbase. Note temporary shoulder on left.



Completed flexible base on right, with traffic carried on temporary shoulder and left half of slab.



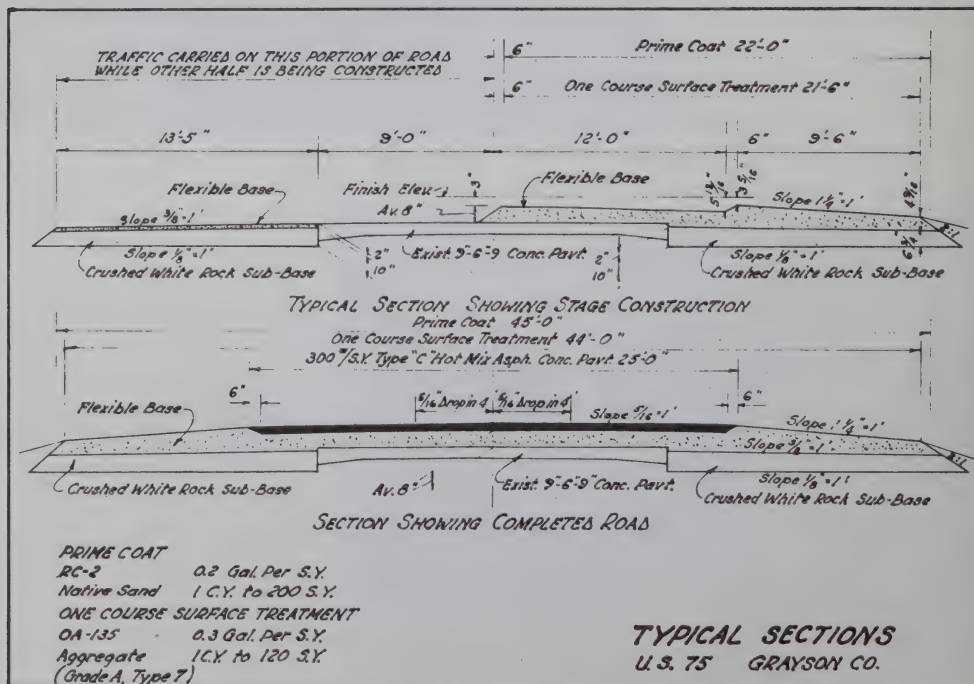
Sand admix being dumped on crushed stone prior to mixing and laying.



Traffic traveling on right half of completed flexible base. Flexible base on left half of road has not been surfaced.



Completed road prior to completion of project.



Current Policies Governing Issuance of Special Permits for Movement of Oversize and/or Overweight Loads

MAINTENANCE DIVISION

A growing concern by Highway Department officials over the rapid deterioration of our Primary System, much of which is over 20 years old; the tremendous increase in volume and weight of loads exceeding the legal limits, and the results of the road tests conducted in Maryland and Kansas, have been the prime reasons behind attempts to set new limits as to maximum axle loads above which overweight permits would not be issued. Safety and convenience to traffic as well as possible damage to highways were considered in limiting size and length of loads.

During the past several months, the Commission has endeavored to adjust policies regarding the issuance of overweight and/or oversize permits. Several public hearings have been held at which representatives of the trucking industry appeared and presented their side of the transportation problem. The results of these efforts have been published in Maintenance Circulars Numbers 47-51, 50-51, 52-51, and 57-51.

The instructions contained in the above named Circulars are outlined below and are the policy under which we are presently operating.

I. General

In general, on all applications for oversize, overlength, or overweight permits, the following questions should be considered:

A. Can the load be reasonably dismantled?

B. Can another type of vehicle reasonably be used to make the load legal as to axle load or length?

C. Does the weight per inch of width of tire exceed the statutory limit?

D. Will the movement of the load cause material damage to the highway?

If the answer to any of the above is "Yes," the application should be refused.

II. Overweight

If the application qualifies under section I above, then permits may be issued by the District Engineer under the following conditions without prior approval from the Austin office:

A.

1. Legal axle load.
2. Gross loads 80,000 pounds or less.
3. Movement based on tabulation of Permissible Axle Loads shown in the Permit Load Chart.

B.

1. 25,000 pounds maximum axle load.
2. 45,000 pounds maximum tandem axle.
3. 100,000 pounds gross load.
4. Movement is over the highways shown on Routing Maps for Loads Not Exceeding 25,000 Pounds Single Axle, 45,000 Pounds Tandem Axle, and 100,000

Pounds Gross.

5. Load is properly distributed over the axles.
6. This leeway, in Item B, is for isolated movements and not for mass movements.

In the event load exceeds limits in Items A or B above, but is qualified under Section I, the application will be referred to File D-3 with all pertinent load distribution data and will receive consideration, including a determination of adequacy of structures and pavement on the route. Approval or refusal will be based upon this finding.

When the transportation of Military Cargo is proposed, involving loads in excess of that shown in Item B above, it is necessary that this Department first be furnished with a certificate of military necessity for such movement by the designated Military Transportation Officer.

III. Overlength

The general purpose is to reduce the hazard and inconvenience to traffic resulting from exceptionally long loads (exceeding legal length limit) by reducing the length of the pipe and length of haul in the case of the pipe and length of haul in the case of poles.

A. District Engineers are authorized to issue thirty-day time permits for transportation of pipe, poles, logs, steel, etc., under the following conditions:

1. Routes may be indicated in detail on the permit or may be shown on an attached map or sheet. They may be shown as all highways within a certain area excepting certain ones not used, but routes cannot be shown as "All State Highways" or "Statewide."

2. Movement of loads will be restricted to daylight hours only except in cases of emergency when it is necessary to haul overlength pipe or poles to maintain utility service.

3. No double joint pipes are to be hauled under overlength permits.

4. Permits for overlength loads are to be restricted to an over-all length of 65 feet, with the exception that permits for greater length may be issued for movement of pipe or poles for emergency repairs to maintain service of utilities in which case the following note will be placed on the face of the permit: "LOADS EXCEEDING 65 FEET IN LENGTH MAY BE HAULED UNDER AUTHORITY OF THIS PERMIT FOR EMERGENCY REPAIR TO MAINTAIN SERVICE OF UTILITIES ONLY AND LENGTH OF LOAD FOR CONSTRUCTION PURPOSES SHALL NOT EXCEED 65 FEET."

5. Single trip permits may be issued for loads over 65 feet in length after careful study and due consideration of the safety and convenience to the traveling public and the possible damage to the highways.

6. No gross load or axle load carried under an overlength permit shall ever exceed the legal load or the rated carrying capacity of a structure or a load zoned road over which it travels.

B. Applications for time permits which exceed 65 feet

over-all length, except for emergency repairs to maintain service of utilities, will be forwarded direct to File D-3 for handling, and these applications will be supported by a brief letter of explanation as to the reason for requiring a length in excess of 65 feet as well as an estimate of the number of

loads that will exceed this length. Routes showing origin and destination will be shown on each application or on a list or map attached, in duplicate, to each application. Such permits for pipe in excess of 65 feet over-all length may be granted for short hauls only.

THE MAP CARD . . .

FREE HIGHWAY MAP

For your convenience and travel guidance, the Texas Highway Department will mail you an Official Texas Highway Map — upon receiving this completed card.

Name _____		
(Please Print Plainly)		
Address _____		
City _____	Postal Zone _____	State _____
(Please Do Not Abbreviate)		

PLEASE DO NOT WRITE OUTSIDE OF BORDER

Last year the Map Card method of making the Official Highway Map available to Texas motorists was initiated. Traffic Services Division last year received 150,000 cards which were distributed by County Tax Assessor-Collectors with the purchase of license plates. These cards were stapled to maps, put in window envelopes, and mailed out, saving time and expense to all concerned. From all indications, this plan has proved to be good public relations for the Highway Department since it provides Texas motorists with a direct and efficient method for obtaining the map.

CUMULATIVE TOTAL OF CENTER STRIPE

DISTRICT NUMBER	PAINT STRIPE	ASPHALT STRIPE	TOTAL COST	GALLONS OF PAINT USED PER MILE	PAINT STRIPE TOTAL MILEAGE
1	1,358.61	1,975.93	3,334.54	18.60	13.31
2	5,362.24	18,388.57	23,750.81	19.55	28.63
3	5,659.61	15,210.13	20,869.74	15.28	51.38
4	606.99	6,443.95	7,050.94	18.80	4.05
5	5,414.87	12,302.92	17,717.79	10.00	67.09
6	1,986.45	13,431.91	15,418.36	17.37	12.08
7	*15,959.00	34,966.00	50,925.00	17.48	81.65
8	229.00	7,923.23	8,152.23		
9	5,569.87	12,801.13	18,371.00	18.90	42.16
10	3,622.81	9,220.76	12,843.57	16.12	58.98
11	6,506.38	9,038.94	15,545.32	18.08	69.12
12	1,569.45	1,805.27	3,374.72	16.34	12.30
13	2,439.04	3,207.80	5,646.84	10.87	22.91
14	8,015.23	3,370.84	11,386.07	18.40	64.84
15	8,755.78	6,410.40	15,166.18	14.90	90.13
16	920.95	4,083.61	5,004.56	20.06	7.77
17	4,597.60		4,597.60	12.00	70.00
18	11,764.19	13,028.25	24,792.44	13.30	159.80
19	3,142.28	8,560.49	11,702.77	16.54	31.55
20					
21	547.50	9,708.78	10,256.28	17.40	4.39
22	5,124.81	8,123.55	13,248.36	17.96	45.65
23	11,721.17	3,352.26	15,073.43	17.00	136.00
24	12,207.44	6,938.08	19,145.52	16.40	94.00
25		4,015.82	4,015.82		
123,081.27		214,308.62	337,389.89	1,167.79	

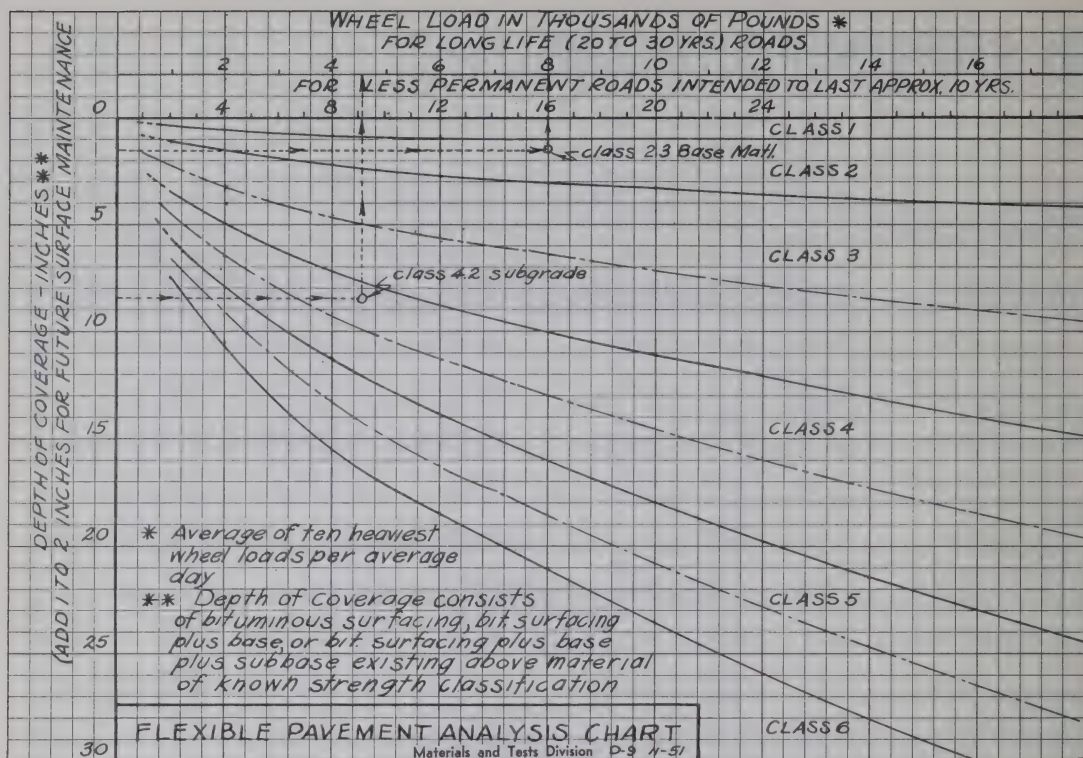
No work performed in District 1,4,5, and 17.

*District 7 includes cost of markers installed by contract and cost of pilot lines.

WORK PERFORMED BY DISTRICT

ASPHALT STRIPE TOTAL MILEAGE	TOTAL MILEAGE	PAINT STRIPE AVERAGE COST PER MILE	ASPHALT STRIPE AVERAGE COST PER MILE
47.90	61.21	102.07	41.25
586.95	615.58	187.29	31.32
239.57	290.95	110.15	63.49
112.10	116.15	149.87	57.48
260.20	327.29	80.71	47.28
111.74	123.82	164.39	120.20
462.54	544.19	133.63	75.59
155.62	155.62		50.91
294.16	336.32	132.11	43.52
283.69	342.67	61.42	32.50
207.50	276.62	94.12	43.56
26.91	39.21	127.59	67.06
37.13	60.04	106.43	86.37
86.21	151.05	123.61	39.10
130.72	220.85	97.14	49.04
90.99	98.76	118.43	44.87
	70.00	65.68	
245.66	405.46	73.61	53.03
104.80	136.35	99.60	81.68
208.63	213.02	124.72	46.53
110.16	155.81	112.26	73.74
103.60	239.60	86.18	32.36
104.85	198.85	129.87	66.17
65.43	65.43		61.37
4,077.06	5,244.85	105.39	52.56

Districts 6, 20, and 25 did not submit a report for December



Estimating Wheel Load Capacities

Example:

Assumptions:

1. Depth of class 2.3 flexible base material = 7 inches.
2. Thickness of bituminous surfacing = $1\frac{1}{2}$ inch.
3. Strength classification of subgrade = 4.2.
4. That one inch of bituminous material will be placed subsequently in maintaining original surfacing.

Solution:

1. Enter left scale of chart for "Depth of Coverage" at a depth of $1\frac{1}{2}$ inches.
2. Follow across chart horizontally to class 2.3 for strength of base material. This is a point of interception which is 30 per cent below top of class 2 material.
3. Project line upward to intercept scales for wheel loads. In bottom

scale read 16,000 pounds for approximately ten year life roads and in upper scale for long life roads read 8,000 pounds.

4. Enter left scale of chart for "Depth of Coverage" at a depth of $8\frac{1}{2}$ inches.
5. Follow across chart horizontally to class 4.2 for strength of subgrade. This is a point of interception which is 20 per cent below top of class 4 material.
6. Project line upward to intercept scales for wheel loads. In bottom scale read 9,200 pounds for approximately ten year life roads and in upper scale for long life roads read 4,600 pounds. Since these values are lower than those obtained for base material in step 3 above, they should be used as the wheel load capacity values.

CRACK DAMAGE ON MARYLAND ROAD TEST ONE

ROAD DESIGN DIVISION

During the period from June to December, 1950, the Highway Research Board conducted an accelerated traffic test on a 1.1 mile section of concrete pavement located about nine miles south of La Plata, Maryland. The immediate objective was to observe the performance of a concrete pavement under the operation of commercial type vehicles loaded to 18,000 and 22,400 pounds on single axles and 32,000 and 44,800 pounds on tandem axles. Each of the four types of loads was applied to a separate section of the pavement.

Figure 1 shows the principal dimensions of the test section, compared with a typical Texas pavement. Section 2 of the drawing represents about 90 per cent of the existing concrete pavement in Texas, though some of these old pavements have been widened and some covered with a bituminous overlay less than one inch thick.

Judging from soil tests reported to date, it appears that the subgrade of the Maryland section is of higher quality than many of the soils underlying Texas pavements.

Figure 2 shows curves representing the crack damage, in linear feet of cracks per square foot of pavement surface, plotted against the number of individual axle applications causing the damage. (It should be noted that one pass of a tandem axle is represented on this graph as two individual axle

applications). As indicated at the top of the curve for the 22,400-pound axles in tandem, damage exceeding 0.10 feet of cracks per square foot of pavement represents advanced destruction.

It can be seen from Figure 2 that 16,000-pound axles, when closely spaced in tandem, generally caused more than twice the damage of 18,000-pound single axles applied an equal number of times. Similarly, 22,400-pound axles in tandem created more than three times the damage caused by 22,400-pound single axles.

Also evident from the graph is the excessive damaging effect of axles of any type loaded much beyond the legal limit.

Investigation of the subgrade under the test pavement has not yet been completed, and it is possible that variations in subgrade conditions could partially explain why closely spaced axles were more destructive than single axles. However, measurements of strains in the Maryland pavement, as well as elsewhere, have indicated that greater damage to concrete pavements can always be expected from closely spaced axles than from axles widely separated.

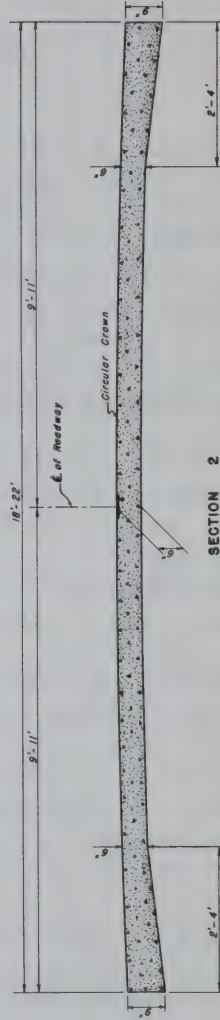
Results of the Maryland test are still under study. It is expected that future Highway Research Board reports on this project will contain additional information of much value to the Department.



MARYLAND ROAD TEST ONE PAVEMENT COMPARED WITH TYPICAL PRE-WAR TEXAS RIGID PAVEMENTS



SECTION 1
 MARYLAND ROAD TEST ONE PAVEMENT
 (Steel reinforcing 5.35 lbs. per sq. yd.)



SECTION 2
 TYPICAL PRE-WAR TEXAS RIGID PAVEMENT
 (Steel reinforcing 2-5 lbs. per sq. yd., approx.)

NO.	DATE	REVISION	BY	CHKD.	APP'D.
1	10/1/54				
2	10/1/54				
3	10/1/54				
4	10/1/54				
5	10/1/54				
6	10/1/54				
7	10/1/54				
8	10/1/54				
9	10/1/54				
10	10/1/54				

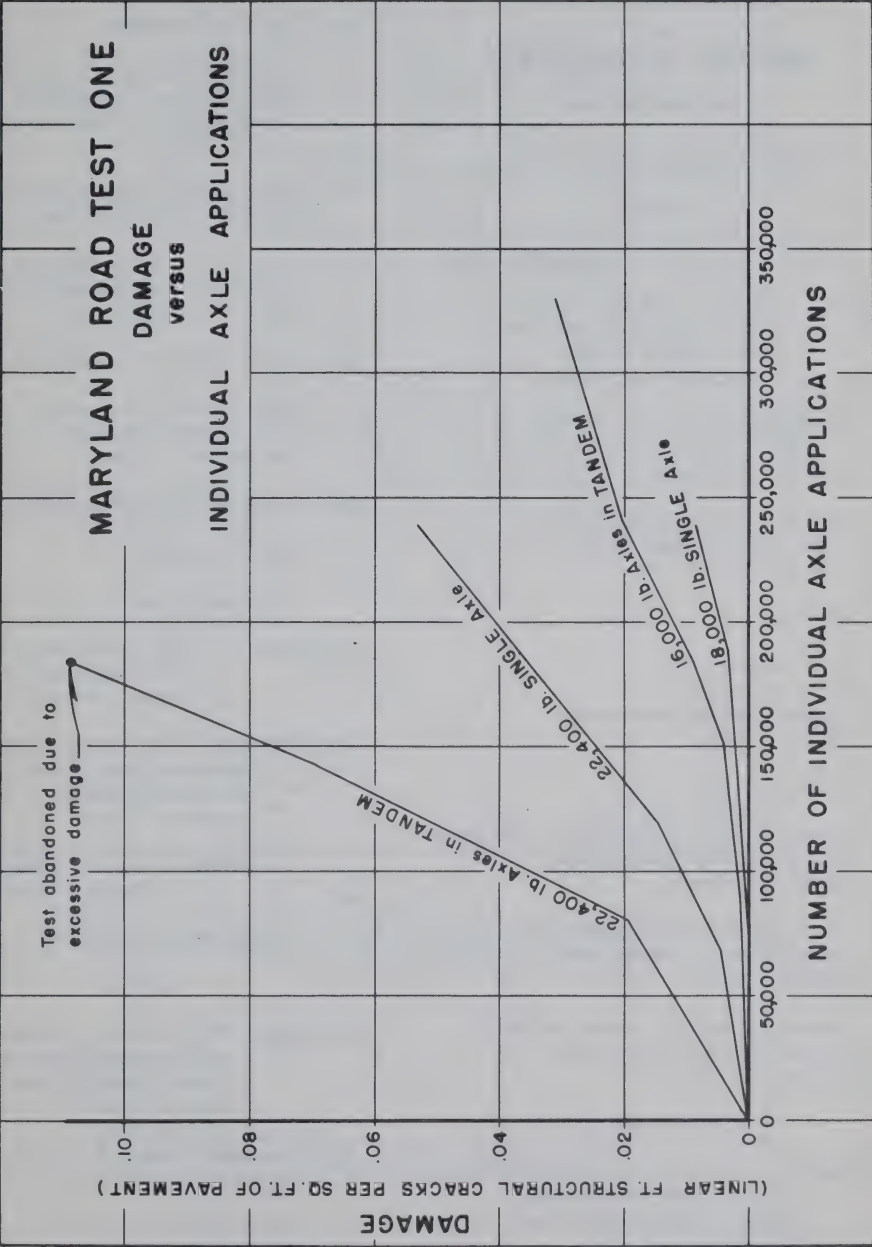


FIG. 2

TENTATIVE
PROGRAM

TWENTY-SIXTH
Annual Short Course
in
HIGHWAY ENGINEERING

COLLEGE STATION, TEXAS

WEDNESDAY, MARCH 5, 1952

Morning

8:00 Registration, Memorial Student Center

Chairman: Dr. S. R. Wright, Head
Civil Engineering Department
Texas A&M College
College Station, Texas

10:30 Invocation

10:35 Address of Welcome

Gibb Gilchrist, Chancellor
Texas A&M College System
College Station, Texas

10:45 Response

Ed Bluestein
District Engineer
Texas Highway Department
Atlanta, Texas

11:00 Selected Subjects

Honorable E. H. Thornton Jr., Chairman
Texas Highway Commission
Galveston, Texas

Honorable Fred A. Wemple, Member
Texas Highway Commission
Midland, Texas

Honorable Robt. J. Potts, Member
Texas Highway Commission
Harlingen, Texas

Afternoon

Chairman: George M. Garrett, Engineer-Manager
Fort Worth Urban Project
Texas Highway Department
Fort Worth, Texas

2:00 National Conditions and the Texas
Highway Picture

D. C. Greer, State Highway Engineer
Texas Highway Department
Austin, Texas

**EMERGENCY CONDITIONS AFFECTING
HIGHWAY CONSTRUCTION**

2:20 The Steel Situation

Herbert Eldridge
Chief Engineer of Planning
Texas Highway Department
Austin, Texas

2:40 National Scrap and Its Application to
the Highway Department

Walter H. Leo, Supervisor
Steel Industry Scrap Mobilization Committee
Dallas, Texas

3:00 Contractor's Current Problems

Delbert Ward, President
H. B. Zachry Company
San Antonio, Texas

3:20 Floor Discussion on the Above Topics

7:00 Annual Banquet

Memorial Student Center

Toastmaster: D. C. Greer, State Highway Engineer
Texas Highway Department
Austin, Texas

Speaker: W. J. Van London, Engineer-Manager
Houston Urban Project
Texas Highway Department
Houston, Texas

Subject: A Local Yokel Visits
Yurop and the Fur Yeast

THURSDAY, MARCH 6, 1952

Morning

Chairman: R. E. Killmer, Engineer-Manager
Dallas Urban Project
Texas Highway Department
Dallas, Texas

9:00 Methods Employed in District 7 for
Improving Riding Surfaces of Asphalt Roads

R. N. Jennings,
District Maintenance Engineer
Texas Highway Department
San Angelo, Texas

9:25	Methods of Widening and Resurfacing Old Concrete Pavements	11:00	Progress Report on the Correlation of the Static Load Capacity of a Pile with the Shearing Strength of the Surrounding Soil
	T. S. Huff Assistant Engineer Road Design Texas Highway Department Austin, Texas		A. C. Kyser, Assistant District Engineer Texas Highway Department Houston, Texas
9:55	Thoughts and Theories on Penetration Surfaces	11:20	Discussion
	J. P. Kearby, Sr. Resident Engineer Texas Highway Department Decatur, Texas		M. D. Shelby Senior Soils Engineer Texas Highway Department Austin, Texas
10:15	Recess	11:30	General Aspects of the Baytown Tunnel
10:25	Construction of Underreamed Foundations for Structures		Jim Douglas to designate speaker.
	W. C. Raby, Sr. Resident Engineer Texas Highway Department San Antonio, Texas	12:00	Noon-Adjournment.
10:45	Discussion		
	Verne Watson Contractor Fort Worth, Texas		----- Note: District Engineers Meeting - Tuesday, March 4, Ballroom, Memorial Student Center. -----

Changes in Men in Charge of
ROAD CONDITION REPORTS . . .

District 6

Bertram N. Peebles	Tel: 925-W
T. S. Brown (Alternate)	Tel: 701-M

District 12

L. T. Mings	Tel: Madison 3414
R. A. Scott (Alternate)	Tel: Melrose 7276

BRINGING CONCRETE PILES TO BEARING

Submitted by
JOHN E. BLAIR, District Engineer

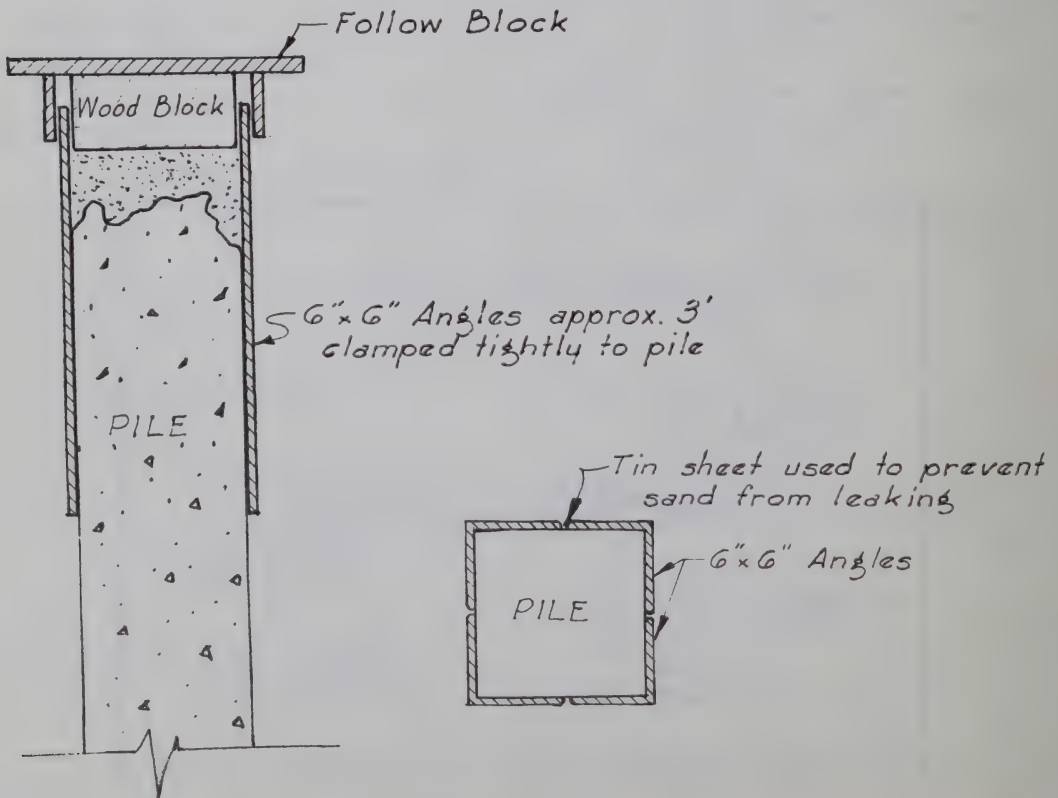
In the new bridge we are building on F. M. 60 near Lyons, we had a lot of difficulty bringing the concrete piles to bearing, because the heads shattered badly, even under very moderate driving.

We have succeeded in driving these on down without rebuilding the heads, and our method might be applied on some other job.

As shown in the sketches, we put a six-inch by six-inch steel angle about two or three feet long on each corner of the pile, clamping these tightly by means of clamps not shown.

These angles projected some six inches above the highest point of the damaged pile head, forming a pocket. Spaces in this pocket where sand might leak out were stopped with sheets of tin.

This pocket was filled with damp sand, and the driving was done through a wooden block bearing directly on the sand. All damaged piles were driven on down to bearing without further difficulty.



INTEROFFICE MEMORANDUM

TO: Mr. W.E. Simmons Date November 8, 1951
FROM: W.E. Suter Responsible
SUBJECT: Method of Obtaining Better Looking Depression Around Desk
Bridge Drains

Probably you have noticed at the drains on some of the slab bridges an irregular, unworkmanlike surface of the depression. This can be greatly improved, if not entirely eliminated, by using a method devised by Mr. Harry E. Hougensen, Carpenter in Foreman Ennis Gilley's crew now working at the Trout Creek Bridge on F.M. 255. Two slabs have been poured using Mr. Hougensen's "drain radius template" and very excellent results were secured. A very smooth, practically perfect radius results from use of this novel template.

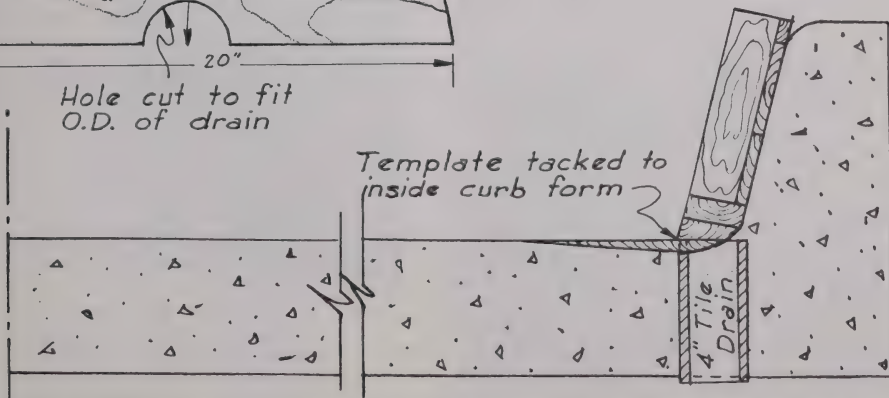
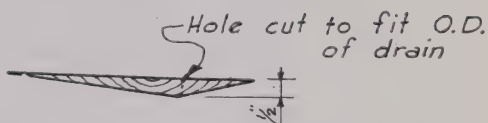
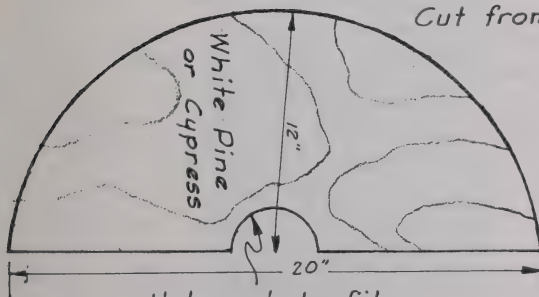
I am passing this information on to you because of its merit.

A pencil drawing detailing the template is attached.

Jasper Co.
C 877-1-2
F.M. 255
Day Labor Job

LAYOUT OF TEMPLATE

Cut from 1"x12" board



SECTION THRU FRESHLY POURED FS-8 SLAB
Showing "Drain Radius Template in Place"

SIGNS AND BARRICADES

FRANK W. CAWTHON, DISTRICT ENGINEER

In compliance with instructions contained in Construction and Maintenance Circular No. 8-50, we are submitting photographs of the trial set of signs and barricades suggested, and our comments.

The complete set of signs and barricades were constructed in February, 1951, and have been in continuous use since then on concrete pavement break-out job on U.S. 75 in Collin County. This section of pavement is 20 feet wide with dirt shoulders and has proved to be an excellent section on which to use the signs and barricades in each arrangement shown in sketches accompanying Construction and Maintenance Circular No. 8-50.

Our experience with this group of signs and barricades has been very satisfactory. U.S. 75 carries a very heavy traffic load, 4,000 to 5,000 v.p.d. on this section, and we had found it very difficult to control prior to use of these signs and barricades. With the use of this trial set of signs and



U.S. 75, Collin County break-out job. Looking north - Approach to area being constructed.



Looking north - Flagman holding hand sign, 25 M.P.H.



Looking north - Flagman holding STOP sign.



Looking south - Barricade and cone arrangement.



Looking south - Barricade arrangement.



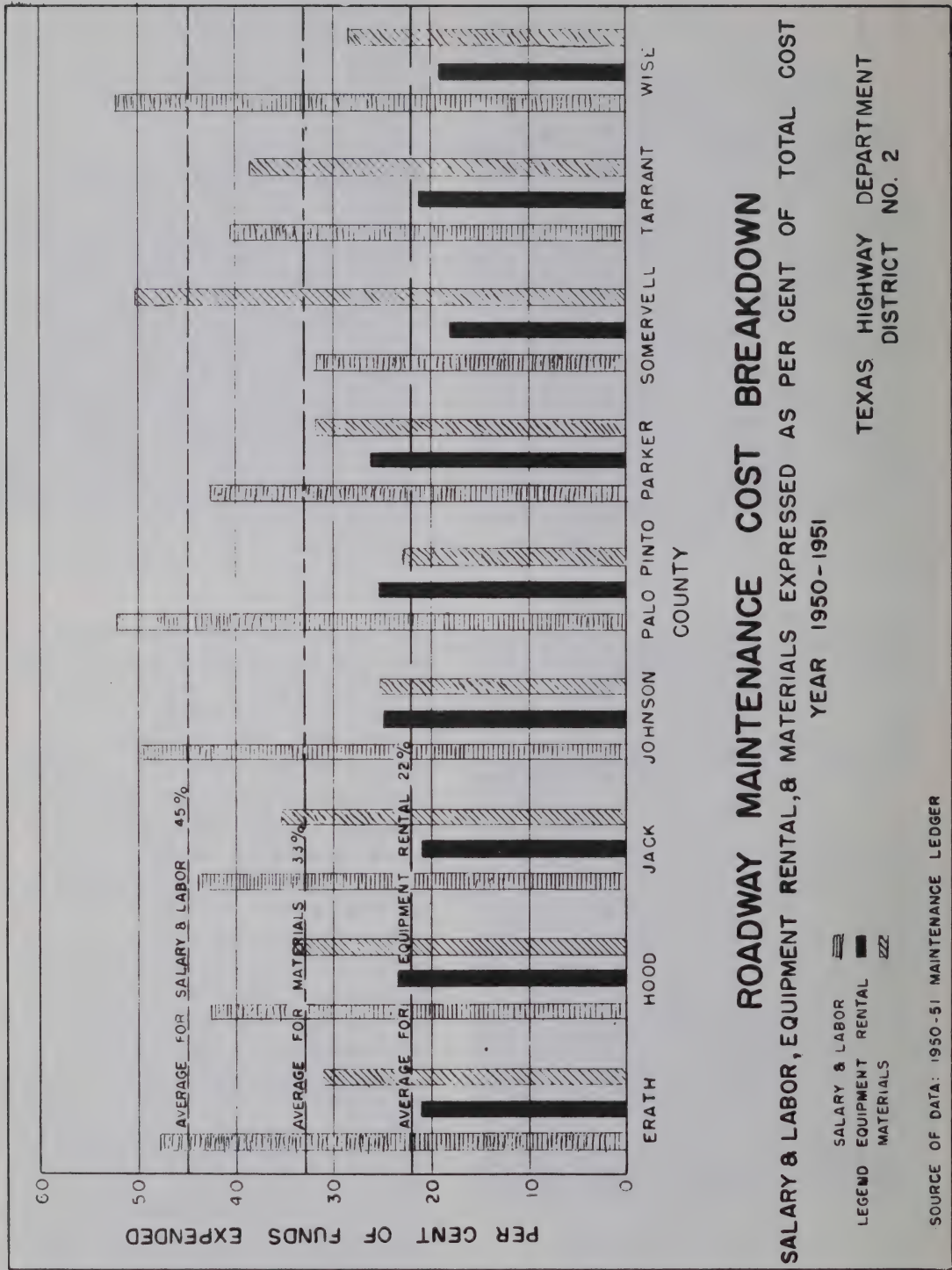
End of working area.

barricades we have been able to control the traffic satisfactorily and at the same time afford our employees much better protection.

The only objection that might be offered is the difficulty experienced in transporting and setting up the group of signs, since it takes some time and extra trucks to make a move. On heavy repairs, however, the signs and barricades do not usually have to be moved during a day and in some cases do not have to be moved for two or three days. We believe that the advantages gained offset the loss of time encountered in a move.

Use of the rubber cones to channelize traffic for the different arrangements is very satisfactory. We have used these extensively, especially in and around Dallas on our four lane roads and find that they work very satisfactorily in channeling traffic.

We believe that this group of signs and barricades should be adopted and standardized because they do an excellent job of forewarning and directing traffic and afford additional protection to employees.



FOLDING SIGNS



The folding sign shown in these pictures is not a Highway Department standard except for the message which it bears. The sign has been suggested for use at certain locations in place of the C-13 SLOW ICE ON ROAD sign which is to be mounted on a movable support.

The purpose of the folding sign is to provide the proper warning with a

minimum amount of sign erecting and transporting. Use of the folding sign is restricted to highways and bridges which ice up regularly. When ice is on the highway, the sign is opened up making the message visible. When ice is not present, the sign is folded down covering the message. In other respects the sign is used exactly as the standard C-13 sign.

LOW COST EQUIPMENT SHEDS

Recently Constructed at Camp Hubbard



From: Press Headquarters
French Room - Rice Hotel
Houston, Texas
January 21-24, 1952

Meeting January 21, 1952

50th ANNIVERSARY MEETING - AMERICAN ROAD BUILDERS' ASSOCIATION

WELCOME TO TEXAS

By

E. H. THORNTON, JR.
Chairman, Texas Highway Commission

It is indeed a privilege to be permitted to represent Governor Allan Shivers in extending to the American Road Builders' Association an official welcome to the State of Texas.

The continued development and expansion of the road system of the State of Texas is a major objective of our people and our government. Roads are the definite lifeline to connect the vast areas of Texas, as well as to keep pace with our expanding economy. The American Road Builders' Association, with its recognized national leadership in the field of building more and better roads, could have chosen no place in our entire country for its Annual Meeting that is more aware of the importance of highways and roads than Texas. You are among friends and admirers and all Texas is indeed hopeful that this meeting will be both pleasant and profitable.

I would be derelict in my duty if I did not remind you that Texas is not only the largest state in the union but embraces more than 1/12 of the total area of the continental United States. I would further call to your attention that this broad expanse called Texas is not just millions of acres of undeveloped ranch lands, since we have 7 3/4 million people who take pride in calling Texas their home. These people also drive and use automobiles. Texas has just taken the third place position in the nation in the number of motor vehicles registered during the past year. Much of our commerce moves by motor vehicles, as indicated by the statistics that show Texas a close second to California in the number of motor trucks operating on our highway system. Highway development and highway transport is big business in our state, as represented by the fact that approximately 600,000 people are employed in the highway transport industries of Texas. It would, therefore, follow that, since almost 1/10 of our population is directly or indirectly connected with highway transport for a livelihood, we must be most careful in this state that affliction or paralysis shall never come to our system of highway transportation. The Texas Highway Commission is at this time endeavoring to the best of its ability to inform our people of the needs

E. H. Thornton, Jr.

--2--

of our highway system, in order that these ills may be cured before it is too late.

In conclusion, permit me, with all of the sincerity at my command, to extend to President Reinhold and Executive Vice-President General Reybold, as well as all of the membership of the American Road Builders' Association, a genuine, wholehearted welcome to the State of Texas.

HOUSTON GULF FREEWAY CEREMONIES . . .



From: Press Headquarters
French Room - Rice Hotel
Houston, Texas
January 21-24, 1952

50th ANNIVERSARY MEETING - AMERICAN ROAD BUILDERS' ASSOCIATION

PRELIMINARY DEVELOPMENT, PUBLIC ACCEPTANCE,
AND FINANCING OF TEXAS URBAN EXPRESSWAYS

Dewitt C. Greer
State Highway Engineer
State of Texas

Meeting, Tuesday January 22, 1952

Texans are occasionally accused of doing a small amount of bragging and I am in a position to admit that at times, in our zeal to display the wonders of our state, we might be somewhat guilty of an overdisplay of our wares. In the case of Urban Expressways, however, we would like to admit in all humility that we started late and profited by the experiences of the states that pioneered in this field. We started planning our Urban Expressway Systems in the waning days of World War II, realizing that the future of Texas was unusually bright and our metropolitan areas were badly in need of this type of development to prevent further traffic stagnation and a constant rise in accident tolls. We are rather proud of our achievement in this field during the past five years, in that we have developed, built, and opened to traffic substantial portions of Expressways in the four major cities of our state - Houston, Dallas, San Antonio, and Fort Worth - and are now under construction on additional sections in these cities and have added to the list the smaller cities of Austin and Beaumont.

In the inception of this Urban Expressway Program in Texas we realize full well that we were embarking in a new field of endeavor for our Highway Department. We were fully aware of its magnitude, its complications, and its problems. We knew that to build these Expressways properly we were going to encounter a vast amount of preliminary planning, a tremendous task on public acceptance, and what appeared to be an almost insurmountable obstacle of adequate finance. With these thoughts in mind we conceived the idea of the development of the Engineer-Manager type of administrative control. Our idea in this case was that we would select from our organization an engineer with an unquestioned background of experience and ability, truly a top-notch capable of assuming a broad expanse of authority and responsibility in the field of highway engineering, to be the Engineer-Manager of the Urban Expressway Project in a

given city. His duties and responsibilities were outlined as covering all of the field of public acceptance, detailed negotiations, advance planning, plan development, and construction. We are proud of the success of this system of administration. We called in outside consultants that we considered to have the background of experience in other states and areas to give us the advance planning kick-off to reorient our thinking into the Urban Expressway field of endeavor. Public acceptance of these heavy thoroughfares into or adjacent to the big business districts, on wide and expensive right-of-way supplied by the locality, far exceeded our expectation. We found the people of Texas in these congested urban areas to be ready for relief. In reality, the co-operation of our cities has not only kept pace with our available finance for construction but has led us two or three years at every stage of the planning.

We were short of engineers and designers in the inception of our program and in order to expedite the work, we utilized engineering firms who had built up sizable organizations during the war for government project planning and construction. This gave us a year or more advantage in moving our work to actual construction. When we began to receive bids we found our contractors well equipped and ready for this sizable task. The work progressed rapidly and efficiently, permitting us to open many sections of our Urban Expressways well ahead of the scheduled completion time.

The finance plan on Urban Expressways in Texas is rather simple. The city and state governments join in the advance planning as well as the detailed preparation of project plans. All of the engineering cost is borne by the State of Texas. Right-of-way information is prepared by the state in conjunction with the city government. The city government, at its expense, secures a clear unobstructed right-of-way for the project. The State of Texas bears the full cost of construction of the facility and maintains the facility after its completion. The cost of illumination and its upkeep is shared on a 50-50 basis by the city and the state. In truth and in fact, the cities of Texas and the State of Texas are partners in this endeavor of Urban Expressway development, and we are both quite proud of the part that we have played in the success of this endeavor for the relief of congestion in urban areas. We have no desire to dissolve this partnership. We think that, in addition to the actual accomplishments in concrete and steel, this partnership has developed a close liaison between the state and city governments in Texas that is unexcelled anywhere.

From: Press Headquarters
French Room - Rice Hotel
Houston, Texas
January 21-24, 1952

50th ANNIVERSARY MEETING - AMERICAN ROAD BUILDERS' ASSOCIATION

DESIGN CONSTRUCTION AND BENEFITS
OF
HOUSTON URBAN EXPRESSWAYS

W. J. Van London, Engineer-Manager
Houston Urban Expressways
for
The Texas Highway Department

After the promotion, upper echelon agreements and finances have been cleared the next and one of the most important steps in the development of expressways is rights of way, particularly in cities.

Since the establishment of the Texas Highway Department, 35 years ago next week, it has been the policy of the Highway Commission to require the Cities and Counties to provide the rights of way necessary for all highway improvements. This was quite simple when improvements were made on existing country roads with 50' to 75' rights of way but became a bit complicated and expensive with new and revised road locations and 100' rights of way. With the advent of expressways it became a major operation, both in effort and finance.

As the increase in costs of rights of way, which was financed from general revenue and roads and streets bonds, brought increased protests from local governments the writer recognized the need of providing "earmarked" funds to purchase the rights of way necessary for a modern highway system. A movement was started in 1939 which bore fruit two years later in the form of \$900,000 in county bonds earmarked for State Highway Rights of Way. Since then 14 million dollars in bonds have been earmarked by the City of Houston and the County for this purpose. The popularity of these bonds is indicated by the large favorable majority vote they have always received. This method of financing rights of way is now followed by many other cities and counties.

Reservation of rights of way for future expressways is another important step. The City of Houston and the State of Texas have reached agreements on a 30 mile Expressway System, some of which will not reach the construction stage for 15 years at the present rate of financing construction. The State has presented location layouts to the City and the City is protecting a minimum 300' wide right

of way for the entire system. This accomplished by refusing building and improvement permits and purchasing property where forced to do so.

The Expressway System consists essentially of an East-West and a North-South Freeway across the City, passing within a half mile of the central business area and connecting with partially controlled access highways near the city limits, which are so designed that they can be developed as freeways if and when required.

In general, the expressways for a distance of 5 to 7 miles in each direction from the central business area will have six 12 foot traffic lanes divided with 32' frontage roads on each side. Street and railroad grade separations with traffic interchange connections average about one-half mile apart. With few exceptions traffic interchanges are of the diamond pattern which permits traffic to move in a diagonal course from and to the freeway without the reverse rotary movement required by the conventional clover-leaf design. One exception is an intersection of three major highways which is expected to handle in excess of 100,000 vehicles per day. This interchange occupies 94 acres of land and has 5 single-deck grade separations. All traffic moves in the direction of its destination with practically no increase in distance. At a point some 5 to 7 miles from the central business area the freeway traffic lanes are reduced from 6 to 4, provision being made for two additional lanes when required. Frontage roads will be constructed only where and when needed.

Construction was started in 1946 on what is locally known as the Gulf Freeway which extends from Houston to Galveston, a distance of 40 miles. Construction will be completed in July this year at a cost of 21 million dollars. The right of way cost was approximately 2 3/4 million dollars. The first 3 1/2 mile section was opened to traffic in Houston in October, 1948 with a traffic load of 28,800 on the first day. The present traffic load is 69,500 vehicles per day with occasional peak daily loads in excess of 72,000.

A unique feature of the Gulf Freeway is the traffic collection and distribution system near the central business area. The usual method of loading and unloading a freeway is thru a few interchange points, often of the clover leaf type to major cross streets. The Gulf Freeway is loaded and unloaded thru a "4-Street System" 1 1/4 miles long which merges with the Gulf Freeway to the southeast and will later merge with the North Expressway to the northwest. This "4-Street System" in-

tersects eighteen north-south streets which carry almost all of the huge volume of traffic between the central business area and the southern and southwestern sections of the city. All of the traffic movements through the 72 intersections are controlled by an interconnected, synchronously operated traffic control signal system. The four east-west streets with the eighteen cross streets, thus controlled, constitute a master interchange of great magnitude, capable of collecting and dispersing the very large volumes of traffic demanded of it, rapidly and efficiently.

The "4-Street System" was improved and the traffic signal installed by the State at a cost of \$1,100,000. The first 3 1/4 miles of the Gulf Freeway was illuminated with mercury vapor lamps providing an average of 0.8 foot candles at road level. The cost was about \$317,000. Installation of illumination has been discontinued for the present because of high installation and maintenance cost.

Payment and structure design standards are of the highest order. Briefly, all designs provide for handling the present maximum legal truck loadings with a safety factor of between 2 and 3. Every effort is made to avoid any unnecessary features-to maintain the greatest simplicity commensurate with functional design and good appearance. A very considerable saving was effected in bridge foundations by the use of round shafts cast in drilled holes. It is estimated that this method cost 50 per cent less than the usual foundation practices. A saving of approximately \$325,000 was effected on 6 miles of completed work.

The average cost of work completed and under contract is \$1,600,000 per mile. While this is a high cost per mile for construction it is not a relatively high cost in terms of vehicle miles of service rendered. On this basis it is approximately equivalent to a Farm-to-Market road costing \$8,000 per mile and carrying 300 vehicles per day. Regardless of the cost per mile the value of any traffic facility depends upon the service it renders. Travel-time studies made before and after the Gulf Freeway was opened to traffic show that travel time was cut in half by the Freeway. Using a nationally recognized minimum cost of 2 cents per minute for operation of passenger cars and 5 cents for trucks, the cost of about \$11,000,000 for the section now in operation would be saved by the users in about 4 years. Very few investments pay a dividend of 25 per cent per year. Along with this saving in travel time the Gulf Freeway is also saving lives. The traffic fatality rate for

the Gulf Freeway is 60 per cent lower than the average for urban traffic and 75 per cent lower than the national average rate.

A recent survey discloses that property served by the Gulf Freeway has increased in value 50% more than property in other parts of the City in the past five years.

The type of Expressway I have been discussing, which passes thru residential and lightly developed industrial areas, is relatively simple and inexpensive when compared to the type required in the highly developed area to the west, north and east of the central business section. Most of the area thru which it is necessary to locate an Expressway in order to reach the origin and destination of the traffic is covered with industrial buildings, railroad yards and streets. In a length of 6 miles of Expressway and exit-entrance ramps being considered there are 62 railroad tracks and 26 streets that must be left open to traffic. There is no "4-Street System" available to collect and distribute traffic. The traffic must be carried at right angles to the Expressway for a considerable distance at several points to reach suitable street connections in industrial areas and near the central business section. The average distance between major street and railroad crossings is about 700 feet and in many cases less than 400 feet. Therefore, if we develop a freeway the entire facility must be at least partially depressed or partially elevated.

Studies of an elevated Expressway indicate that a double-deck structure providing for one-way traffic on each level might be the solution to the problem in some areas. In some cases such a structure would follow existing streets with supporting columns astride the streets which would remain in service. Double and single level structures would be required to carry traffic to street connections in the central business and industrial areas.

The Expressway section would cost 5 million dollars per mile at present prices. Entrance and exit ramps would cost about 3.5 million dollars per mile, a total of about 30 million dollars for the area. A staggering amount--where the money might come from, and when, no one knows. However, the monetary saving to the user would be greater in this area than on the Gulf Freeway. It is estimated that the saving would equal the cost of the facility in less than 10 years.

ABOUT THE DISTRICTS

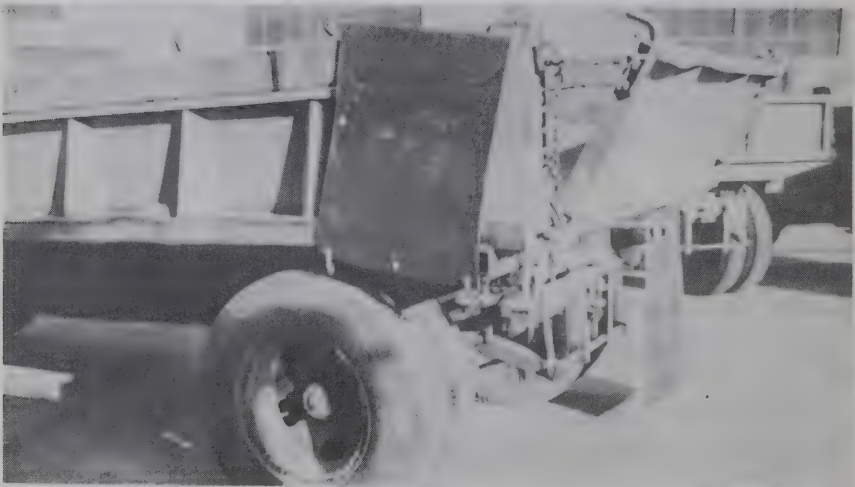
DISTRICT 18'S FLEXIBLE METAL FLAG STANDARD



This metal flag standard is used for mounting flags on equipment in District 18. It is made from one-fourth inch mild round rod. The rod has a loop in the upper end to protect the flag, one in the center for tying the flag, and at the bottom, there is a five-eighths inch diameter loop for bolting to equipment.

Breakage of these flexible flag standards is negligible, making them much more desirable than easily broken wooden standards. When bent, these mild steel flag standards can be easily straightened. They can be quickly attached to any equipment.

DISTRICT 1'S METHOD OF INSTALLING MUD GUARD FLAPS ON DUMP TRUCKS



Note that instead of using chain, they use snap hooks. This eliminates any protrusion while flap is in carrying position.



. . . Last night as I was driving from West Texas into Dallas I came upon a strip of highway between - - - and - - - that apparently is fairly new. This black top is so smooth that when the rain came up it made it practically impossible to drive on. It was slicker than ice. There isn't one sign along there that I could find, warning motorists that it was slick when wet.

From the time I left - - - until I came to the - - - River and stopped in one of those three cafes at that point, I saw two trucks and three passenger cars turned over as a result of this slick road. One passenger car with a trailer had to get off the highway and discontinue his trip. He couldn't manage it. I stopped at the cafe at the - - - River and it was the topic of conversation. We don't know if anyone was injured.

I thought surely you would want to know of this stretch on U.S. -- and State --, between - - -, and - - -. The worst part was right out of - - -, eastward, and all five of these wrecks were within a ten-mile stretch.

This road ought to have a new top with gravel set in it so it won't be so slick.

Thanking you in advance in behalf of all who travelled this road last night, I remain

(Signed)

• • •

. . . My husband and I have just returned from a 5,200 mile trip which covered 23 states, Mexico, and Canada.

In nineteen days of travel, we met with all kinds of highways and road conditions and we can freely say that our best highways were in the State of Texas. Routes were well marked and easy to follow.

However, we have one criticism which we are passing along to you, and that is, we felt that the arrows which indicate route changes were too small and in most cases, you had to be almost on top of the arrow before you knew whether to take a right or left turn. Because the arrowhead is almost the same size as the body of the arrow, it is difficult for a driver to ascertain the proper turn far enough in advance so that he will be in the correct traffic lane. One of your highway department men suggested that we pass this information on to you, as constructive criticism is what helps to maintain your wonderful highway system.

Mrs. James M. McGee
Waterbury, Connecticut

• • •

. . . In behalf of my brother and sister-in-law's three orphans, I beg the Highway Department to do something about the fixing of these asphalt death trap roads which we, the people of Texas, pay to travel on. My brother and his wife were killed on Highway - - -, also Mrs. - - - of - - -. Can't the people who make these roads fix it so they wouldn't be slick as glass when it rains? Just two days before, three women gave their lives just a short distance from where this accident occurred . . .

(Signed)

● ● ●

. . . I had the misfortune to drive over the worst stretch of road that I have ever seen in over 30 years of driving, and believe me, it was in TEXAS. If you don't know about it, you certainly should.

Last Friday, while on a business trip, on Highway --- northeast of - - - I hit the worst mess I've ever seen on any road. It was raining and if it had not, I can't imagine what it would have been like dry. For about fifteen miles going into - - -, they have evidently attempted to top the old paving. The road apparently, as far as the repair gang is concerned, is complete. It has been surfaced with a thick coat of gooey asphalt and several inches of gravel. Your wheels pick up this mess in big gobs, worse than any black gumbo on any farm road in Central Texas.

To make a long story short, it has cost me \$37.50 to get this stuff off of my car. The taxpayers certainly got a poor deal on this one.

(Signed)

● ● ●

. . . On going to - - - by way of - - -, I have noticed that there are no double yellow lines indicating hills all the way from - - - to - - -. There are many dangerous hills on that new highway and I know of two persons that have been killed on these hills and one other on a bridge. I have not seen any Cross Road or Side Road signs either. I am just suggesting some safety precautions that are sure needed.

(Signed)

● ● ●

. . . May I thank you. You had the best roads already, and are making them better, and saved me from the grief of a detour. (Noted on a PLEASE DRIVE CAREFULLY CARD).

T. B. Holliday
Elmhurst, Illinois

● ● ●

. . . I enclose bills amounting to \$74.97 which were incurred by me to have my 1951 Ford repaired.

This accident occurred on F.M. - - -, about four and a half or five miles from - - -, Texas, on December 7, 1951, at about 11 o'clock A.M.

The operator of the caterpillar tractor with a roller attached was spreading gravel at the time and motioned me to go by him on the right side, and he pulled over toward the bank to enable me to pass. Just after I had passed the Cat and just before I had passed the roller, he suddenly pulled back onto the road and the back wheel on the roller caught my car at the door and did the damage.

The driver of the Cat never did stop to inquire about the damage, but the man driving the grader did stop and talk to me, and said that he would report it to your office.

I will thank you for remittance to cover this damage, and will appreciate your usual prompt attention.

(Signed)

• • •

. . . Recently we have had quite a few "passing in no passing zone" violations within the city limits of - - -, on Highway - - -.

Most of the offenders claim they did not notice the no-pass stripe. The marker stripes are very dim.

Would greatly appreciate your cooperation in having these markers repainted.

The greater part of - - - is a "no passing zone."

(Signed)

• • •

. . . As a motorist who has just completed a round trip by car between Cheyenne and New Orleans, I feel that the very least that I can do is to take this opportunity to express my appreciation for the truly magnificent set of modern highways that the State of Texas has provided for the use of its own people as well as those of us who from time to time travel through via the southwestern route. They are truly unsurpassed anywhere in the U.S., and the Highway Department certainly deserves great credit for this immense accomplishment.

H. K. Hoffman
Cheyenne, Wyoming

• • •

IN MEMORIAM

John W. Lambert was hit by a car and instantly killed January 11, 1952, while working in a gang pouring joints in District 3. This accident occurred a few miles west of Nocona. This work area was being protected by a flashing light on a truck and by a flagman. For some undetermined reason, the driver apparently saw neither.

William Jones, a District 20 maintenance employee, was fatally injured December 12, 1951 while operating a roller on F.M. 563 south of Liberty. Just before reaching Jones a standard on an empty logging truck fell from upright to a horizontal position and swept him off of the roller.

